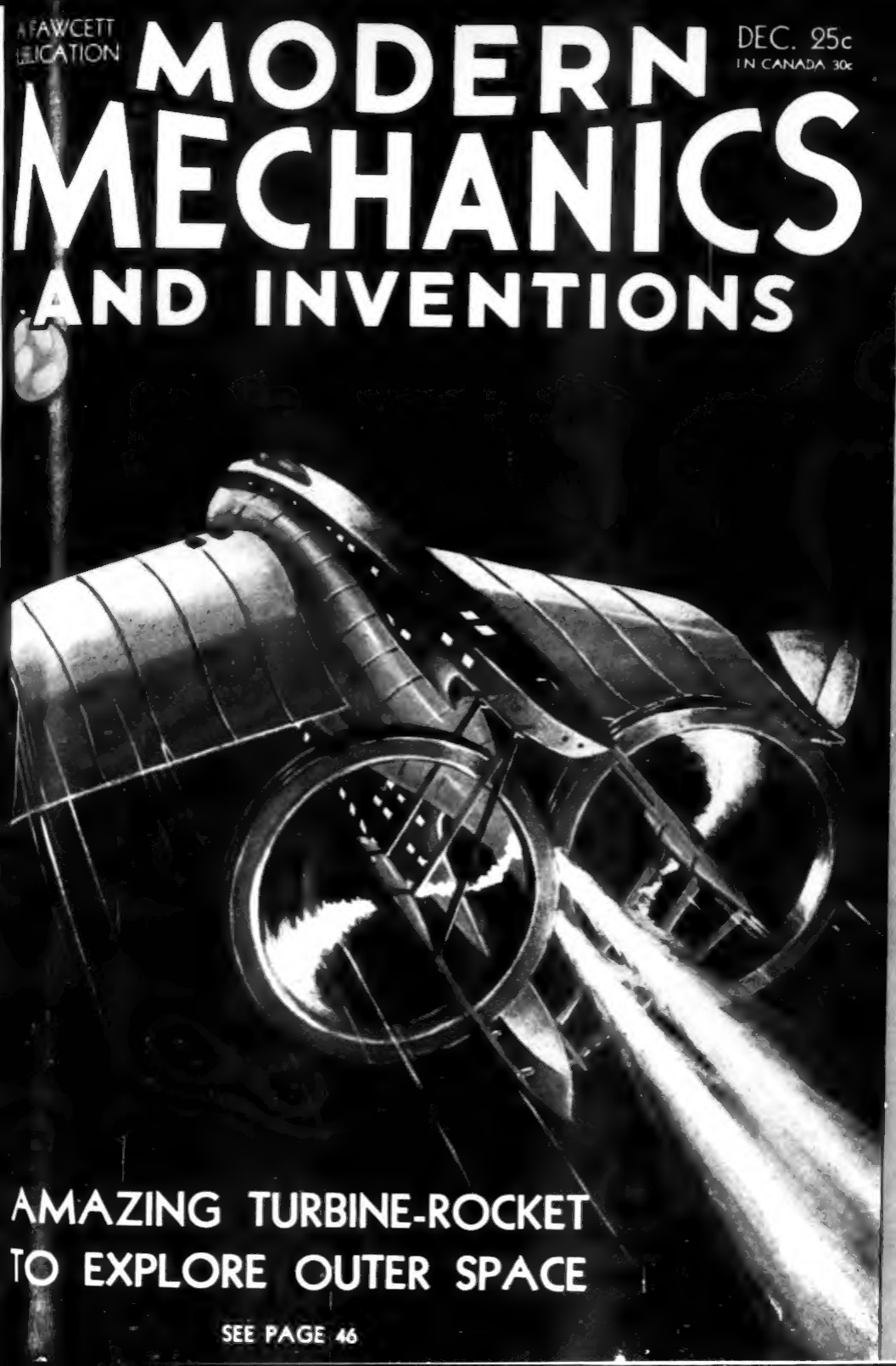
A FAWCETT PUBLICATION

DEC. 25c
IN CANADA 30c

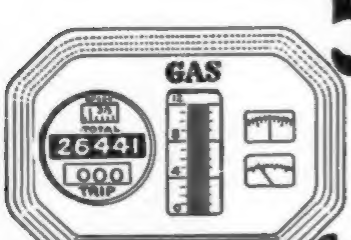
MODERN MECHANICS AND INVENTIONS



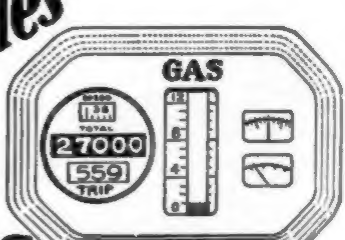
AMAZING TURBINE-ROCKET TO EXPLORE OUTER SPACE

SEE PAGE 46

Over the Mountains from Los Angeles



559 Miles on 11 Gallons of GAS



Think of it! FIVE HUNDRED FIFTY-NINE MILES over rough mountainous country burning only ELEVEN GALLONS OF GASOLINE. Imagine more than FIFTY MILES to the GALLON. That is what the WHIRLWIND CARBURETING DEVICE does for D. R Gilbert, enough of a saving on just one trip to more than pay the cost of the Whirlwind.

THE WHIRLWIND SAVES MOTORISTS MILLIONS OF DOLLARS YEARLY

Whirlwind users, reporting the results of their tests, are amazed at the results they are getting. Letters keep streaming into the office telling of mileage all the way from 22 to 59 miles on a gallon, resulting in a saving of from 25% to 50% in gas bills alone.

Mark H. Estes writes: "I was making 17 miles to the gallon on my Pontiac Coupe. Today, with the Whirlwind, I am making 35 5/10 miles to the gallon. Am I glad I put it on? I'll say so!"

P. P. Goerzen writes: "I made an actual test both with and without a Whirlwind, getting 13½ miles without and 34 6/10 miles with the Whirlwind, or a gain of 21 miles to the gallon. The longer the Whirlwind is in use on the machine the better the engine runs, has more pep and quicker starting. It makes a new engine out of an old one, and starts at the touch of the starter button."

R. J. Tulp: "The Whirlwind increased the mileage on our Ford truck from 12 to 26 miles to the gallon and 25% in speed. We placed another on a Willys-Knight and increased from 12 to 17 miles per gallon."

Arthur Grant: "I have an Oakland touring car that has been giving me 15 miles to the gallon average, but I can see a great difference with the Whirlwind, as it climbs the big hills on high and gives me better than 23 miles to the gallon of gas, which is better than 50% saving in gas."

W. A. Scott: "I had my Whirlwind for three years. Winter and summer it gives the same perfect service, instant starting, smoother running, and what I have saved in gasoline these last few days has bought other luxuries which I could not have afforded previously."

Car owners all over the world are saving money every day with the Whirlwind, besides having better operating motors. Think what this means on your own car. Figure up your savings—enough for a radio—a bank account—added pleasures. Why let the Oil Companies profit by your waste? Find out about this amazing little device that will pay for itself every few weeks in gas saving alone.

FITS ALL CARS

In just a few minutes the Whirlwind can be installed on any make of car, truck or tractor. It's actually less work than changing your oil or putting water in the battery. No drilling, tapping or changes of any kind necessary. It is guaranteed to work perfectly on any make of car, truck or tractor, large or small, new model or old model. The more you drive the more you will save.

SALESMEN AND DISTRIBUTORS WANTED

To Make up to $100.00 a Week and More

Whirlwind men are making big profits supplying this fast-selling device that car owners cannot afford to be without. Good territory is still open. Free sample offer to workers. Full particulars sent on request. Just check the coupon.

WHIRLWIND MANUFACTURING CO.
Dept. 740-A, Station C Milwaukee, Wis.

GUARANTEE

No matter what kind of a car you have—no matter how big a gas eater it is—the Whirlwind will save you money. We absolutely guarantee that the Whirlwind will more than save its cost in gasoline alone within thirty days, or the trial will cost you nothing. We invite you to test it at our risk and expense. You are to be the sole judge.

FREE OFFER COUPON

WHIRLWIND MANUFACTURING CO.,
Dept. 40-A, Station C, Milwaukee, Wis.

Gentlemen: You may send me full particulars of your Whirlwind Carbureting device and tell me how I can get one Free. This does not obligate me in any way whatever.

Name .....
Address .....
City .....
County ..... State.....

☐ Check here if you are interested in full or part time salesmen's position.

WHAT DOES 1932 HOLD FOR YOU?

1931 was an unusual year—and most of us are glad it is gone! Our minds are fixed on brighter days.

But don't deceive yourself! *A change in conditions will not necessarily mean a change for you.* Prosperity is still an individual challenge!

In this period of economic transition, success is not more difficult—it's more exacting! It doesn't come—you go after it through careful *training!*

You can blame the year, curse your luck, wonder what's wrong—one year is like another if *you* do not make them different! Don't you know hundreds of men who never knew a "good" year?

1932 is new! You can make it the most profitable year of your life. You can lay the groundwork for a career which will furnish more satisfaction and more money. Indeed, 1932 is a golden opportunity for you!

How can you do it? That's easy! Acquire more *training*—do your job *better*, prepare yourself for the *next* job. But doing it is *not* so easy. It takes courage, sacrifice and hard work. Quitters should continue wasting their spare time! Thousands of *fighters*, to get the training they need, are enrolling for International Correspondence Schools Courses. They are going to make 1932 a good year for themselves. So can you! This coupon is a beginning. Mark and mail it—today!

INTERNATIONAL CORRESPONDENCE SCHOOLS

"The Universal University" **BOX 2324-M, SCRANTON, PENNA.**

Without cost or obligation, please send me a copy of your booklet, "Who Wins and Why," and full particulars about the subject *before* which I have marked X:

TECHNICAL AND INDUSTRIAL COURSES

- ☐ Architect
- ☐ Architectural Draftsman
- ☐ Building Estimating
- ☐ Wood Millworking
- ☐ Contractor and Builder
- ☐ Structural Draftsman
- ☐ Structural Engineer
- ☐ Electric Wiring
- ☐ Electrical Engineer
- ☐ Electric Lighting
- ☐ Welding, Electric and Gas
- ☐ Reading Shop Blueprints
- ☐ Telegraph Engineer
- ☐ Telephone Work
- ☐ Mechanical Engineer
- ☐ Mechanical Draftsman
- ☐ Machinist
- ☐ Toolmaker
- ☐ Patternmaker
- ☐ Pipefitter ☐ Tinsmith
- ☐ Bridge Engineer
- ☐ Bridge and Building Foreman
- ☐ Gas Engines ☐ Diesel Engines
- ☐ Aviation Engines
- ☐ Automobile Mechanic
- ☐ Plumbing ☐ Steam Fitting
- ☐ Heating ☐ Ventilation
- ☐ Sheet Metal Worker
- ☐ Steam Engineer
- ☐ Steam Electric Engineer
- ☐ Civil Engineer
- ☐ Surveying and Mapping
- ☐ Refrigeration
- ☐ R. R. Locomotives
- ☐ R. R. Section Foreman
- ☐ Highway Engineering
- ☐ R. R. Bridge and Building Foreman
- ☐ Air Brakes ☐ Train Operation
- ☐ Chemistry ☐ Pharmacy
- ☐ Coal Mining Engineer
- ☐ Navigation ☐ Boilermaker
- ☐ Textile Overseer or Supt.
- ☐ Cotton Manufacturing
- ☐ Woolen Manufacturing
- ☐ Agriculture ☐ Fruit Growing
- ☐ Poultry Farming ☐ Radio
- ☐ Marine Engineer

BUSINESS TRAINING COURSES

- ☐ Business Management
- ☐ Office Management
- ☐ Industrial Management
- ☐ Personnel Management
- ☐ Traffic Management
- ☐ Accountancy ☐ Cost Accountant
- ☐ C. P. Accountant
- ☐ Bookkeeping
- ☐ Secretarial Work
- ☐ Spanish ☐ French
- ☐ Salesmanship ☐ Advertising
- ☐ Business Correspondence
- ☐ Lettering Show Cards ☐ Signs
- ☐ Stenography and Typing
- ☐ Complete Commercial
- ☐ Civil Service
- ☐ Mail Carrier
- ☐ Railway Mail Clerk
- ☐ Grade School Subjects
- ☐ High School Subjects
- ☐ College Preparatory
- ☐ Illustrating
- ☐ Cartooning
- ☐ Lumber Dealer

Name.....*Age*.....*Address*.....

City.....*State*.....*Occupation*.....

If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada

A FAWCETT PUBLICATION
Other Fawcett magazines are Screen Play, Triple-X Western, Battle Stories, Hollywood, Screen Book and Amateur Golfer and Sportsman.

Vol. VII — No. 2

MODERN MECHANICS AND INVENTIONS

PRICE 25 CENTS
30 Cents in Canada
This magazine is not connected with or associated with any other magazine of a scientific or mechanical nature.

December, 1931

TABLE OF CONTENTS *for* DECEMBER

SPECIAL FEATURES

Amazing Turbine Rocket to Explore Outer Space - - By Lew Holt 46
Earthquakes Reveal Secrets of Earth's Interior - - By Jay Earle Miller 56
Models That Have Helped Justice - - - - By Alfred Albelli 72
Fiery Visitors From Unknown Worlds - - - By Calvin Frazer 83
Acquiring Skill With Cards - - - - - By Kenneth Murray 88
Science Hatches Oysters on Mass Production Farms - By Earle W. Gage 94
"Floods of Mud" Now Explained by Science - - - By Ivan E. Houk 108

GREAT "HOW-TO-BUILD" ARTICLES

Fun and Profits From Air Rifle Gallery - - - By Dale Van Horn 126
Crazy Music From Odds and Ends - - - - By Thornton Hallett 140
Building the Ramsey Flying Bathtub - - - - By W. H. Ramsey 146

New Mechanical Inventions

A Novel Hand-Powered Craft - - - 50
Electric Eye Fights Ship Fire With Gas - 51
Powerful Magnet Sharpens Blades - - 54
"Man-Made Fur" Has Fabric Base - - 55
Outboard Motor for Toy Speedboat - - 55
Electric Eye Opens Theatre Door - - 62
"River Zepp" Hits 50 m.p.h. Clip - - 63
Motorized Diving Chamber - - - 66
Drive Ball Through Loop in New Game - 80
No Skidding on Metal Streets - - - 80
Pneumatic Bed Raft Appears - - - 93
Coin-in-Slot Automat Delivers Ice - - 100
Transformer Prevents Frozen Pipes - - 100
Recent Patents of Unusual Interest - - 101
Mechanical Helpers Make Housekeeping Easy 102
Scooter Converted Into Sled - - - 131
Catamaran Propelled by Motor or Hand - 132
Electric Ironer and Table in One - - 138
Lawn Sweeper Does 5 Men's Work - - 138
Electric Eye Regulates Light - - - 152
Smoke-Stack Abates Spark Hazard - - 152
Haying Speeded by Crusher-Mower - - 154

Interesting Shorter Features

Gridiron Strategy Made Simple - - - 52
New Facts About Skyscrapers - - - 70
Fortune Making Ideas for Inventors - - 79
By Raymond Francis Yates
Scientific Hoaxes Have Fooled the World - 86
Oddities of Science - - - - - 99
By Nic Sprank
Chemists Make Plants Work Overtime - 118
Millions in Junk and Waste Material - - 124
A New Animal From the North - - - 130
Tide Mills Harness Power of Ocean - - 139
Sunken Ship Raised by Hand - - - 144
By Jay Earle Miller
Bargain Time for Home Builders - - 164
By Maurice I. Flagg
Free Analysis of Your Handwriting - - 166
(Continued on page 6)

Published monthly by Fawcett Publications, Inc., at 501 7th Ave. So., Minneapolis, Minnesota. MODERN MECHANICS AND INVENTIONS entered as second class matter September 30th, 1928, at the Post Office, Minneapolis, Minnesota, under the act of March 3rd, 1879. W. H. Fawcett, Publisher; Roscoe Fawcett, General Manager; Jack Smalley, Managing Editor. Copyright 1931. Advertising Manager: Chicago office, 35 East Wacker Drive (Phone State 2955); New York office, 52 Vanderbilt Avenue, Room 606 (Phone Vanderbilt 3-8490). All manuscripts should be addressed to our editorial office at 529 So. 7th Street, Minneapolis, Minn. Manuscripts will not be returned unless accompanied by return postage. Advertising forms close on the 20th of the third preceding month. Price 25 cents a copy; $2.50 a year in the United States and possessions. In Canada, 30c per copy, per year $3.50. Other Postal Unions, $3.00 per year. Printed in U. S. A.

They Told Him Salesmen Were "Born"

But Now He Makes $10,000 a Year ...Thanks to This Little Book

IT was just a little free book that made the difference between Ed Pinkham and the rest of the men in our shop. Nobody ever imagined that Ed would land, even in the $5,000-a-year class, let alone be making $10,000 before he was thirty. Ed didn't know himself the abilities he had in him as a money-maker.

But one day, a strange occurrence changed his whole life. During his lunch hour Ed started to read a little book he had brought to work with him.

"It's a book called 'The Key To Master Salesmanship,' Bill," he told me. "It's the most amazing thing I ever read. I never dreamed there was so much in salesmanship. You ought to send for a copy yourself. It's free."

"Huh!" said Luke Jones. "Does that book tell you how to become a salesman?"

"It sure does," replied Ed, enthusiastically.

"Don't waste your time," advised Luke. "You can't learn how to be a salesman. A fellow has to be 'born' that way to be a good salesman."

Ed just smiled at that, but he said nothing. Soon afterward he quit the shop, and we forgot about him. And then last night, I met Ed again—driving a snappy new sedan and dressed like a million dollars.

"For Pete's sake," I said. "What are you doing nowadays, Ed?" He smiled. "City salesmanager for the Steel Castings Company," he told me. "What are you doing?"

"Still at the shop," I replied. "But what I want to know is, how do you come to be salesmanager for Steel Castings? They're one of the biggest firms in the business."

Ed smiled again. "Remember that book on Salesmanship that Luke Jones was kidding me about one day? Well, when I finished my Salesmanship training the Association I took it from gave me a choice of a number of jobs through their Free Employment Department. I got a wonderful job, and I had wonderful training, so I've had a pretty successful time of it. They made me City Sales Manager three months ago at ten thousand dollars a year."

"Good night!" I said. "And Luke and I are still punching the old time clock!"

Ed looked at me seriously. "See here, Bill," he said. "Are you sport enough to risk two cents that you can do as well as I did? Then spend the two cents to write to the National Salesmen's Training Association tonight and get their free book. Then take their course. When you are qualified, their Free Employment Department will help you get a good sales job. Not only will they help you get the job but they agree under an iron-clad money-back penalty that you must be satisfied with the training received—or they refund your tuition!"

FREE—TO EVERY MAN

A book—but what a book! Just seven ounces of paper and printers' ink—but it reveals facts and secrets that have led hundreds of men to success beyond their fondest expectations! See for yourself—FREE—why thousands have increased their earning capacities, after reading "The Key To Master Salesmanship." A. L. Galbraith of Detroit, Michigan, went from a bank teller's job to the position of branch manager of a large insurance company, after this book opened his eyes. You can understand how it helped A. A. Fidler of Montgomery, Alabama to raise his pay 700%. You'll know how it made C. B. Sterling of Boldman, Kentucky, an officer and manager of his Company, raising his pay to ten times what it was. Learn for yourself the REAL TRUTH about salesmanship. You do not risk one penny or incur the slightest obligation. And since it may prove the turning point in your career it is certainly worth your while to fill out and mail the coupon below. Do it now!

NATIONAL SALESMEN'S TRAINING ASSN.
Dept. W-704, N.S.T.A. Bldg., Chicago, Ill.

NOW SENT FREE

National Salesmen's Training Association,
Dept. W-704, N.S.T.A. Bldg., Chicago, Ill.

Without cost or obligation please send me my free copy of "The Key To Master Salesmanship," including details of your FREE EMPLOYMENT Service.

Name .....

Address .....

City ..... State .....

Age ..... Occupation .....

TABLE OF CONTENTS — Continued From Page 4

Aviation

New Plane Has Extensible Wings - - 50
New Glider Popularizes Sport - - - 63
Schneider Racer Speeds 415 Miles an Hour 64
Deck Flying Not so Easy as it Looks - - 67
New York to Build Central Airport in Bay - 69
Revolutionary Parachute Opens Instantly - 81
Flying Wing for Stratosphere Flight - - 92
Aerial Train Demonstrated - - - 120
Emergency Exit for Airplanes - - - 120
Plane Talk - - - - - - 121
Edited by H. H. Arnold
"Experimental Toy" Airplane - - - 152
World's Smallest Practical Airplane - - 154

For Craftsmen, Young and Old

Useful Novelties From Plaster of Paris - 111
Money-Making Ideas for Workshop Fans - 129
Fonyfotos Make Artistic Pictures - - 153
Amateur Electrician - - - - - 155
Edited by Sewell Lehman
Things to Make With Tools - - - 163
Edited by A. Neely Hall

For the Motorist

Bear Skin Garb Boosts Gas Sales - - - 50
New Glareless Auto Headlights - - - 51
Automatic Jack Works From Dash - - 62
Auto Kennel for Hunting Dogs - - - 66
Heated Grips for Steering Wheel - - 68
Fast Air-Driven Messenger Car - - - 68
Rollers Prevent False Start - - - 76
Germany Builds Peace Auto Tank - - 76
Folding Spade Fits Auto Pocket - - - 92
Auto Cooker Uses Exhaust Heat - - - 93
Unique Auto Adopted by Postal Service - 100
Cycle Car Wins Auto Contest - - - 104
Six-Year-Old Has Midget Racer - - - 120
Traffic Signs Controlled by Cars - - - 131
Land-Going Sailboat as Information Bureau 138
Shows Condition of Car's Oil - - - 154
Service Truck Carries Snow Plow - - 158
Motor Mechanics - - - - - 159
Edited by Ray F. Kuns

For the Radio Fan

Robot Ship to Explore Arctic by Radio - 61
Radio Increases Milk Yield of Cows - - 63
Radio Sextant Shoots Sun Thru Clouds - 77
Automatic Tuning Device - - - - 93
Sparks From the Radio Editor - - - 133
Sound Photos Test Radio Sets - - - 152
Radio Beacon Controlled by Dial - - 154

Handikinks

Pocket Level From Pill Bottle - - - 66
Flywheel for Toy Helicopter - - - 92
Long Range Water Gun From Elder Branch 112
Magnet Racing Game - - - - 112
Trolley Teaches Skating Painlessly - - 112
Cord and Shears Trick - - - - 112
Stunts for Motoring Convenience - - 113
A Page of Ideas for Handymen - - - 114
Ideas for Household Improvements - - 115
Labor-Saving Workshop Kinks - - - 116
Engines to Run Toy Machines - - - 117

The Shop Mail Box will be found this month on page 12

Interesting Items

Drug Now Solves Murder Mysteries - - 50
Illuminated Bridge Table - - - - 54
New Card for Bridge Players - - - 54
Blind Sign Names With Stencil - - - 54
Indian Cure for Insomnia - - - - 55
Rats Gnash Teeth When Happy - - - 55
Why Electric Shocks Cause Death - - 62
Mile of Rope Supports Largest Flag - - 68
Synthetic Coffee Oil Patented - - - 68
Edison Raps Crude Inventions - - - 68
Motorized Sled Speed 20 M.P.H. - - 69
Reproduces Old Masters in Sand - - 76
Cigarettes Prevent Forest Fires - - - 80
Blazing Oil Well Extinguished by Water - 81
Compressed Air Torpedo Check - - - 92
Science Studies Odd Quake Lights - - 100
Science Solves Mystery of Thrills - - 130
Stocking Protector of Rubber - - - 132
High Speed Film Improves Movies - - 153
Swimming Pool for the House Top - - 158
Colored Glass Repels Insects - - - 158
Health Bread Made From Seaweed - - 158

Edited by Experts

Listed here are the members of the Modern Mechanics Board of Editors, all qualified by national repute to serve as authorities. They will gladly answer questions from readers if stamped envelope is sent. Address them in care of this magazine, 529 S. 7th St., Minneapolis, Minn.

Donald G. Cooley
Chief of Staff

Major H. H. Arnold
Former Assistant Chief, U. S. Air Service

Pilot Gene Shank
Famous Aviator, Holder of Light Plane Endurance Flight Record

S. S. Rabl
Seaplane Designer and Naval Architect

A. Neely Hall
Author of "The Boy Craftsman," etc.

L. B. Robbins
Nationally Known Radio Expert

Ray F. Kuns
Principal, Cincinnati Automotive Trade School

Alfred Albelli
New York Correspondent

Philip L. Rhodes
Naval Architect

Charles Hall
Former Editor of "Motor Boat"

Jay Earle Miller
Associate Editor and Chicago Correspondent

Bob Gordon
J. Russell Dye
Associate Editors

Opportunities

were never so great for technically trained men!

You Can Learn Practical DRAFTING At Home By Mail

UNDER EXPERT COLLEGE INSTRUCTORS

No other calling open to young men of limited schooling, leads so quickly and surely as drafting to big-pay jobs. The field is enormous—world wide. Wake up! Look around you! This is a mechanical and engineering age. Consider our amazing inventions, sky-scrapers, ocean liners, air ships, aeroplanes, automobiles, industrial plants, bridges, dams, power houses, etc. Everything planned or built comes first through the hands of expert draftsmen. What creative work could be more fascinating—a greater inspiration and guide to worthwhile careers? Scores of our noted architects, engineers and builders won their way to fame and leadership with a common school education and a self acquired knowledge of drafting.

$100 a Week Paid Expert Draftsmen

Let the facts about Chicago TECH successes prove that you, too, can train in spare time. Send the coupon below. Investigate! You'll be amazed when you learn how easily young men have mastered drafting through our practical home-study plan. Nothing difficult about it—the simplest, shortest, step-by-step method you can imagine . . . the result of years of successful experience in teaching by mail and in our resident classes. Read the stories of Chicago TECH successes in our big catalog. Hundreds of our graduates are now engineers, architects, designers, builders, contractors, chief draftsmen, superintendents. Drafting was the ladder on which they climbed to big incomes. Chicago TECH is famed everywhere for its successful graduates. Don't delay another minute. Send for all the interesting facts at once. Our low cost and easy terms place this training within the reach of every ambitious man. The first small tuition payment brings everything needed to start the course. Draftsman's table, all drawing instruments, tools, etc.,—a complete, high-grade outfit is furnished each student free of extra cost.

Send For Proof Today!

Let the success of others be your guide to a big-pay job.

DRAFTING OUTFIT
furnished FREE of extra cost

This exceptionally high-grade outfit, a $25 value, complete in every respect, the same as used by expert draftsmen, is furnished without extra charge. Enrollment includes full equipment. No extras to buy. A small first payment under our easy installment plan brings at once everything needed to begin the course and assure rapid progress.

Big FREE Book on Drafting

Send coupon now for your copy. Tells everything you want to know—what to do and how to do it—to succeed quickly in practical drafting work. Opportunity is calling. This is the big chance you've long wanted. Grasp it today.

Chicago TECHNICAL College

Architecture—Engineering—Drafting—Electricity—Building

We also offer complete resident day and evening classes in above subjects. Founded 1904, our College-Training-At-Home Plan is the result of 27 years' experience in training men both in our Chicago College and at their homes by mail.

Chicago Technical College
Dept. R-264, 118 E. 26th St., Chicago, Ill.

Please send me postpaid, your big Free Book on Drafting, telling about opportunities and your College-Training-At-Home Plan. I have checked below the field in which I am particularly interested.

☐ Architectural ☐ Mechanical ☐ Electrical ☐ Structural

Name.....Age.....

Address.....

City.....State.....

☐ Check here if you prefer coming to Chicago to take our short resident day or evening course in Drafting.

Broadcasting stations need trained men continually for jobs paying $1,200 to $5,000 a year.

Television—the coming field of many great opportunities—is covered by my course.

Operators on ships see the world and get good pay plus expenses.

Aviation is needing more and more trained Radio men. Operators employed through the Civil Service Commission earn $1,620 to $2,800 a year.

Talking Movies—an invention made possible by Radio—offers many fine jobs paying as much as $75 to $200 a week to well trained Radio men.

You'll Get *Thrills*-Adventure BIG PAY in RADIO

I will Train You at Home to Fill a Fascinating Job in Radio

Radio's Amazing Growth is Opening Hundreds of Big Jobs Every Year

You like action, romance, thrills! You'll get them in Radio—plenty of them! Big pay, too. That is why I urge you to mail the coupon below for my free book of startling facts on the variety of fascinating, money-making opportunities in this great, uncrowded field. It also explains how you can quickly become a Radio expert—a RADIO-TRICIAN—through my amazingly simple 50-50 method of home-study training. Thousands of men who knew absolutely nothing about Radio before taking my course are today making real money in this growing industry.

Thrilling Jobs That Pay $50 to $100 a Week

There are plenty of good jobs in Radio that pay $50, $75 to $100 a week. For instance, you can see the world in grand style as a Radio operator on shipboard. There are many splendid openings in this line with good pay plus your expenses. You'll also find thrills and real pay in Aviation Radio work. Broadcasting is another field that offers big pay and fascinating opportunities to men who know Radio. And think of the great, thrilling future for men with Radio training in Television and Talking Movies. A Radio sales and service business of your own is another money-making opportunity I train you for.

Earn While You Learn

You stay right at home, hold your job, and learn in your spare time. No high school education or Radio experience is required. I teach you to begin making money shortly after you enroll. My new practical method makes this possible. I give you eight big experimental outfits that teach you to build and service practically every type of receiving set made. Many of my students earn $15, $20, $30 weekly while learning. Lynn Henderson, 317 Elgin Court, Jackson, Michigan, writes: "I have made at least $1,500 servicing and repairing Radio sets and I am just starting my thirty-third lesson."

Get My Free Book

Send the coupon below for my 64-page book of opportunities in Radio and information on my home-study training. It has put hundreds of fellows on the road to bigger pay and success. I back my training with a signed agreement to refund every penny of your money if, after completion, you are not satisfied with the Lessons and Instruction Service I give you. Fill in and mail the coupon NOW!

J. E. SMITH, Pres.
Dept. 1NHA
National Radio Institute,
Washington, D. C.

Act Now

Mail Coupon Today

J. E. SMITH, President
National Radio Institute, Dept. 1NHA
Washington, D. C.

Dear Mr. Smith: Send me your book, "Rich Rewards in Radio." I understand this places me under no obligation and that no salesman will call.

NAME.....

ADDRESS.....

CITY.....STATE.....

Travelled 75,000 Miles

"Dear Mr. Smith: I have worked as Junior Operator on board S. S. Dorchester and Chief Operator of the Chester Sun. I have travelled from 75,000 to 100,000 miles, visited ports in various countries, fished and motored with millionaires, been on airplane flights, etc. I am now with The Jenny Wren Co." (Signed) Robin D. Compton, The Jenny Wren Co., Lawrence, Kansas.

$400 a Month

"The Radio field is getting bigger and better every year. I have made more than $400 each month and it really was your course that brought me to this." J. G. Dahlstead, Radio Station KYA, San Francisco, California.

Employment Service to all Graduates

PATENTS TRADE-MARKS AND COPYRIGHTS

VICTOR BUILDING
Nearly Opposite U. S.
Patent Office

OUR OFFER: FOR PROTECTION OF YOUR INVENTION

YOUR FIRST STEP: The inventor should write for our blank form **—"RECORD OF INVENTION."** A sketch and description should be made on this Blank, signed, witnessed, then returned to us. We also give our opinion as to whether the invention comes within the Patent Office definition of a patentable invention. This "Record of Invention" will serve as "proof of conception." There is no charge or obligation for this service.

Write for Our FIVE Books Mailed Free to Inventors
Our Illustrated Guide Book

HOW TO OBTAIN A PATENT
Contains full instructions regarding U. S. Patents. Our Methods, Terms, and 100 Mechanical Movements illustrated and described.

OUR TRADE-MARK BOOK
Shows value and necessity of Trade-Mark Protection. Information regarding **Trade-Marks and unfair competition in trade.**

OUR FOREIGN BOOK
We have Direct Agencies in Foreign Countries and secure Foreign Patents in shortest time and at lowest cost. **Progress of Invention** contains description of World's Most Pressing Problems by Leading Scientists and Inventors. **All Communications and Data Strictly Secret and Confidential.** Interference and Infringement Suits Prosecuted.

DELAYS ARE DANGEROUS IN PATENT MATTERS

IMPORTANT! To Avoid Delay!
YOU SHOULD HAVE YOUR CASE MADE SPECIAL IN OUR OFFICE to save correspondence, secure protection and early filing date in the Patent Office. To secure special preparation of your case send $25.00 on account with model or sketch and description of invention. If the invention is not patentable we will return fee less cost of search.

Our Lawyers Practice in all U. S. Courts and Defend Clients in Suits involving Patents, Trade-Marks and Copyrights

OUR ORGANIZATION OFFERS PERSONAL SERVICE
By Experienced Patent Lawyers, Solicitors and Draftsmen
We regard a Satisfied Client as our best advertisement, and furnish upon request, lists of clients in any state for whom we have secured patents. We also assist our clients to sell their inventions.

PAYMENT OF FEES IN INSTALLMENTS

It is not necessary that the total cost of a patent be paid in one payment. We permit our clients to pay for their applications in three installments as the preparation of the application progresses in our office.

Highest References — Prompt Service — Reasonable Terms

WRITE TODAY

VICTOR J. EVANS & CO.

Registered Patent Attorneys **Established 1898**
MAIN OFFICES: 672 NINTH ST., WASHINGTON, D. C.

BRANCH OFFICES: 1007 Woolworth Bldg., New York City; 828 Fidelity Phila. Trust Bldg., Philadelphia, Pa.; 514 Empire Bldg., Pittsburgh, Pa.; 1640-42 Conway Bldg., Chicago, Ill.; 1010 Hobart Bldg., San Francisco, Calif.

Gentlemen: Please send me FREE OF CHARGE your books as described above.

FREE COUPON

Name .....

Address .....

PARKS Announces an Executive TRANSPORT PILOTS' COURSE for the mastery of Air-Transportation as a business career

ONE MORE STEP FORWARD! Parks Air College leads again with the first aviation-training of executive caliber. The Executive Transport Pilots' Course requires nearly two years to complete; it is equivalent in scope and thoroughness to four-year college preparation for many other professions.

Transport-license qualification is only the groundwork for this course. From the point where other schools stop, Parks carries on with 28 weeks of executive training for the mastery of air-transportation *as a business!* A few of the subjects covered in this section are Air Transport Operation, Operations Management, Personnel Selection, Economics of Air Line Location, Airport Design and Management, Advanced Aeronautical Meteorology, Public Speaking, Engineering Drawing of Airplane Structure, Advanced Navigation of Aircraft, Salesmanship, Sales Promotion, Advertising, Aircraft Radio Equipment.

Here is super-training for super-flyers—for the men who will organize, finance and operate tomorrow's transportation! Such men are *not* in the majority—but you can be one of them. Have you the vision to see—the determination to grasp—the will to accomplish what this training offers you? Then get the full facts at once. Use coupon below—today!

What the EXECUTIVE TRANSPORT PILOTS' COURSE *includes*---

The first 11 weeks constitute the first semester and include instruction in the Transport Pilots' Ground School, with 50 hours of flying, qualifying the student for his Limited Commercial Pilot's License. The second semester includes 30 weeks instruction in the Airplane and Engine Mechanic's School during which time the student flies 45 hours. The third semester includes 28 weeks of business training and 115 hours of advanced flight instruction, during which time the student will receive 10 hours of absolutely blind flying, 14 hours of night flying and cross-country flying, 14 hours on 5,000 pound gross weight cabin ships, and 8 hours on Lockheeds, world's fastest cabin airplanes. Vacation periods are granted following each semester. Parks Air College, fully accredited and licensed by the United States Department of Commerce, is the world's largest commercial aviation school.

PARKS AIR COLLEGE

Section 12-MM **East St. Louis, Ill.**

MAIL THE COUPON TODAY!

PARKS AIR COLLEGE, Section 12-MM
East St. Louis, Ill.

Send me "Skyward Ho!" and full particulars of the Executive Transport Pilots' Course.

Name_____

Address_____

City_____ State_____

Age_____ Occupation_____

Coyne [illegible] getting actual experience on one of my big synchronous [illegible]

One of my instructors explaining the operation of a radial airplane [illegible]

A BIG PAY JOB for YOU in ELECTRICITY

Don't spend your life in a dull, hopeless job! Don't be satisfied with a mere $30.00 or $40.00 a week! You don't have to! Electricity pays salaries of $60.00, $70.00 and more a week to thousands of fellows probably no smarter than you.

Learn By Actual Shop Work in 90 Days No Useless Theory

Come to Coyne at Chicago and learn Electricity in 90 days—not by correspondence, but by actual electrical work—on huge motors and generators, switchboards, power plants, substations, auto and airplane engines, armatures, etc. You don't need advanced education or previous experience. Coyne has been placing men in Big Pay Electrical Jobs since 1899. Let Coyne help YOU to a good electrical position.

JOBS PAYING $60 to $200 a week

Power Plant Operator	$50 to $70 a wk.
Maintenance Engineer	60 to 100 a wk.
Armature Winding . .	45 to 75 a wk.
Illumination Expert .	50 to 80 a wk.
Radio Service Expert	50 to 100 a wk.
Aviation Ignition . . .	60 to 125 a wk.
Battery Expert	70 to 200 a wk.
Auto Electrician . . .	75 to 200 a wk.
Contractor-Dealer . .	60 to 300 a wk.
Signal Engineering . .	50 to 100 a wk.

FREE EMPLOYMENT SERVICE

EARN AS YOU LEARN

My Employment Department gives you a FREE lifetime service. And if you'll need part-time work while at school to help pay living expenses, we'll gladly help you get it. MAIL COUPON FOR FREE PROOF THAT YOU CAN PREPARE FOR A GOOD ELECTRICAL JOB IN 90 DAYS! Get my Big Free Electrical Book—FREE Radio Service and Auto Electrical offers. Find out about my special low tuition. THIS DOES NOT OBLIGATE YOU IN ANY WAY. JUST MAIL THE COUPON!

COYNE Electrical SCHOOL
H. C. LEWIS, Pres. Founded 1899
500 S. Paulina Street, Dept. 91-53 Chicago, Illinois

FREE ELECTRICAL BOOK Coupon

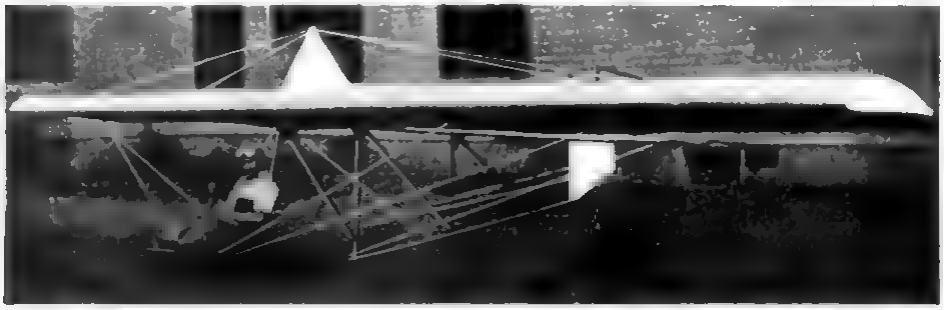
H. C. LEWIS, President
Coyne Electrical School, Dept. 91-53
500 S. Paulina St., Chicago, Ill.

Gentlemen: Please send me your big Free Electrical Book with 151 illustrations. This does not obligate me.

Name .....

Address .....

City ..... State .....



William Bennett of Hillsboro, N. H., writes that he has just had his experience with "Liberty or License," a topic which followers of this column will recognize. Bill constructed the glider shown above and registered it with the Department of Commerce and the New Hampshire Public Service Commission. In a short time inspectors came out and looked over the glider and plans and complimented Bill upon the exactness with which he had followed the prints and upon his workmanship. Then they told him he couldn't take the thing into the air. Bill is now looking for a buyer for the glider.

Andy's Shop Mail Box

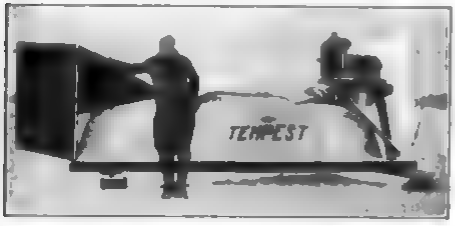
Do you like a good argument? Andy, the Double M. Grease Monkey, who each month gives you the gossip of the Hangar Gang, has some good debates running in the mail box. Here's your reserved seat ticket.

LAST month I started out by putting a picture of a glider up at the top of my opening page and starting in on ice-sleds. This month just for variety, I'm going to put a picture of a glider at the top of the page and start in on ice-sleds. I've still got a few jobs here which I just have to get off my system before the season has come and gone. The first is from Webster, Mass., which seems to be right in the heart of the ice-zipper country.

Box 353, Webster, Mass.

Dear Friend Andy:

I am enclosing a snapshot of an ice boat built by myself, using only such material as could be found around the house and junkyards.



George C. Moritz of Webster, Mass., gets 80 miles an hour with the home-made ice sled shown above.

It is a three-place rig, double cockpit, powered with a 1918 Chevrolet motor (4). The only conversion to the motor was force feed to the main bearings.

The Ford radiator seems to be a little out of place with the Chevvie motor but that was to cut down cost. It works as well. The prop I made myself. I put on copper tips, as the spray from the front runners chewed the blades off on the first trip I made.

The air rudder works with the rear runner, and when making turns at 45 m.p.h. or more prevents skidding. I streamlined the struts and body and believe this made it possible for me to attain the high speed of 80 miles an hour on clear hard ice.

I used narrow hollow-ground runners for hard ice, and wide, flat runners for soft or slushy ice. Wood skis were not practical as they offered too much drag.

The framework is of wood throughout, and the covering is cotton with two coats of dope. The total cost was about 25 bucks. I will be glad to hear from any one interested.

Yours truly,
GEORGE C. MORITZ.

Here's another fellow's idea of what an ice-zipper should be:

1026 Willet St., Schnectady, N. Y.

Dear Andy:

About two years ago I sent in a sketch of

(Continued on page 14)

This Little Gland Robbed Me of Sleep and Health

Until I Discovered a New Hygiene for Men Past 40

IT had been coming on for years—this devilish thing called "Prostate Trouble!" I gave it little thought at first, because I figured that all men experience a certain change about my time in life. That was my big mistake. I thought it was just the breakdown of oncoming age and that I would have to put up with it. But my condition went from bad to worse at an alarming rate

These Common Symptoms

My sleep was broken a dozen times every night. Pains had developed in my back and legs, and I was chronically constipated. I was run down in body and almost broken in mind—practically an invalid at 58

Faces Surgery

It has been my experience that a majority of men past 60—and a surprising number even at 40—had one of these distressing symptoms, but few men had it as bad as I did. I had seen my doctor, of course. But he could offer me but little relief. I spent hundreds of dollars in an effort to avoid an operation. This insidious little gland that robbed me of sleep and health now threatened my very life.

The Turning Point

Then I read one of your advertisements. I admit I mailed the coupon without the slightest hope. There probably never was a more skeptical mind than mine. But this simple little act turned out to be the biggest thing in my life.

I can never thank you enough. I am now sixty. I can go to bed at ten o'clock and sleep straight through. My doctor has pronounced me in normal health. I have had no return of the trouble, and now use your pleasant treatment just fifteen minutes a day, over one or two months, just to make sure that I keep my perfect health.

Millions Make This Mistake

When I was at my lowest ebb, I encountered so many prostate sufferers that I know there must be millions of men doctoring for sciatica, pains in the back and legs, bladder and kidney weakness, chronic constipation and a host of supposed old age symptoms, who should probably be treating the prostate gland! In fact, I learned not long ago that certain medical authorities claim that 65% of men at or past middle age suffer from disorders of this vital gland

My advice to these men is, not to make the mistake that I made. Send the coupon for that little book, "The Destroyer Of Male Health." Find out the facts about this little gland, which the book contains. It explains a prominent scientist's discovery of a new home hygiene—explains how, without drugs or surgery, without massage, diet, or exercise, this method acts to reduce the congestion and combat the dangerous symptoms.

Scientist's Book Sent Free

See if these facts apply to you. Learn the true meaning of these common complaints and see why these ailments in men past 40 are so often directly traceable to a swollen prostate. The book, "The Destroyer Of Male Health" is sent without cost and without obligation.

Simply mail the coupon to

W. J. KIRK, President,
3848 Morris Ave., Steubenville, Ohio.

If you live West of the Rockies, address The Electro Thermal Co., 383 Van Nuys Bldg., Dept 38 B, Los Angeles, Calif. In Canada address The Electro Thermal Co., Desk 38 B 53 Yonge St., Toronto, Can.

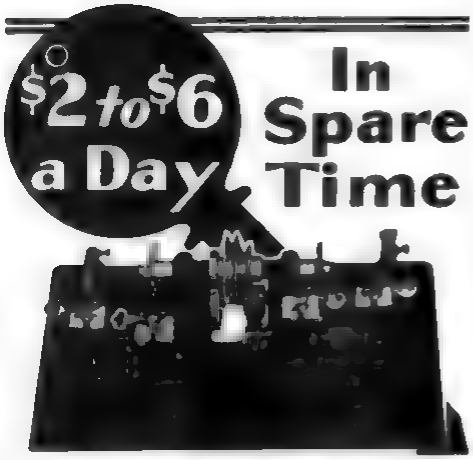
W. J. Kirk, President
3848 Morris Ave.,
Steubenville, Ohio.

Please mail me at once your Free Booklet, "The Destroyer Of Male Health," and full details about the new home treatment. I am not obligated in any way.

Name

Address . . .

City . . . . . State . . . . . .



In the Key Business

Everybody uses keys . . . every day. Many thousands of keys are replaced or duplicated every day . . . for homes, offices, factories, garages, automobiles, luggage, desks, etc. There's good money in the key business and it's all cash and steady the year 'round. Now it's easy for you to get into this profitable business . . . with a

FOLEY Automatic Key Machine

This perfected NEW machine is a marvel of simplicity, accuracy and speed in cutting all kinds of keys . . . cylinder keys, flat keys, bit (house) keys, automobile keys. So easy to operate that a boy can do the work perfectly. Experienced locksmiths declare it superior to anything they have ever seen. Its patented features assure a smooth, finished, perfect-fitting key in one operation, in 12 to 20 seconds.

Start in Spare Time, make $2 to $6 a day to start while you are building up a permanent good-paying business.

The Foley Key Machine is made in several models to fit every need, and sold on easy payments if you wish. A small investment starts you in this money-making business. Fill out and mail the coupon today.

Mail Coupon Today

Foley Manufacturing Co.,
291 Foley Bldg., 11 Main St. N. E.
Minneapolis, Minn.

Please send complete information about the Foley Automatic Key Machine.

Name . . . . . .

Address . . . . . .

. . . . . .

If you would also like information on the Foley Automatic Saw Filer, check here . . . . . .

ANDY'S SHOP MAIL BOX

(Continued from page 12)

an ice sled I threw together. Well, ever since I have been having one H-ll of a time trying to get that sled stepping along the way no sane person would want to drive it.

Well, daybreak has come at last. I shouldn't confess it, but I will, just to get the load off my chest.

My first error was in the design of the body, which blanketed the prop entirely too much. The second error was the prop itself. Due to the stock market crash, I made my own propeller, and of course calculated the pitch way too big for the horsepower of the converted Harley Twin motor.

I have now made my final and best attempt on another prop and a new body. I have cut down the body and have given it a better streamline. The photo (below) shows the result.

When the motor warmed up, and after we got to know our course on the thin ice in the river, we clocked it over a known distance and she did better than 50 miles an hour.

I want to say that MODERN MECHANICS and INVENTIONS is a perfect mag for everybody. It's ace high by me.

Sincerely,
ED SCHNEIDER.

Powered with a Harley Twin motorcycle engine, Ed Schneider's zipper makes 50 miles an hour.

SOME people like to pack ice in sawdust rather than skim over it. In doing this they get the benefit of the congealed aqua long after the ice sled fans have packed away their zippers in moth balls. In case you're this sort of a person, you'll be interested in the picture below and the description that follows.

2807 Fremont Ave. No.,
Minneapolis, Minn.

Dear Sir:

Enclosed is a photo of my gasoline powered ice-cutting machine. A 36-inch saw is used, cutting up to 12 inches deep. The cut can be adjusted as the saw is raised and lowered by a hand winch connected to the rear

(Continued on page 16)

EARN MORE MONEY FREE

I train you at home. I will furnish the tools when I train you.
—Engineer Dobe

MY ANSWER IS "Yes!"

If you accept me to train, can I succeed in drafting?

Yes!

Is Engineer Dobe's answer to "Do you agree to teach me until I am competent and placed in a permanent position, drawing a good steady salary?"

Yes!

Do I actually get all drafting tools, drawing table and all supplies without any extra cost at once?

Yes!

Do I get help as long as I need it about jobs, extra work, fees and how to make extra money?

Yes!

Yes, YOU Ambitious FELLOWS

who want to earn BIG PAY and get BIG RAISES, you need better training to HOLD better jobs. I'll train you at home, and in a few months you will be ready for a good position at good pay.

Men TRAINED BY ME are making $60.00, $70.00 and even $100.00 per week. Get busy. Be ready when YOUR TIME Comes. GET YOUR DRAFTING TOOLS and drafting table just as soon as you begin training. It's like GOING TO WORK.

You need training in the great profession of drafting right now to get ready for the greater opportunity just ahead. The trained draftsmen will get the jobs with the bigger wages. They will be planning and making blueprints for new stores, homes, factories, office buildings and machinery. Every industry uses many draftsmen. I know I am going to be pushed as never before to supply enough good men. So that you may train now and be ready, I am making the offer you read here today.

Drafting is the field for the men who get pay that makes life worth living.

I'll teach you draftsmanship by the practical methods that make a man easily and quickly finish the whole course. I use working methods—as my students who make from $3,000 to $9,000 a year prove.

Learn at home, but on the same kind of actual drafting room jobs you are assigned when you go to work. It isn't hard to do. You don't need talent. If you are interested, I make you a good draftsman, if you will work. Dobe-trained men are draftsmen and chiefs in big concerns all over the country and many have made good abroad.

WARNING—This liberal tool-training offer, while guaranteed to those sending coupon, will positively be withdrawn when a change is necessary—so act NOW.

ACT NOW Before You Put this Magazine Down. Let me send you my books "Successful Draftsmanship" and "My Pay Raising Plan". Remember Draftsmen are needed everywhere. That's the kind of profession to get into. Get started now. Get into a better position, paying a good straight salary the year around.

Here Are the Genuine Imported Set of Drafting Tools You Get As My Student — Without Extra Cost

I founded my training of draftsmen in 1900 and have been training

Send This Coupon

Fill out and mail this Free coupon NOW before you forget it. I will send you my personal offer, without cost or obligation—my "Pay-Raising Plan" and Draftsmanship Book and how I furnish all tools as you train without extra cost. Get the coupon in now—without delay.

ENGINEER DOBE, 1951 Lawrence Ave. Div. 23-59 Chicago, Ill.

FREE PAY-RAISING PLAN

ENGINEER DOBE,
1951 Lawrence Avenue, Div. 23-59 Chicago

Send me free and postpaid, your book, "My Pay Raising Plan," also Practical Draftsmanship Book and Special Offer on all Drafting Tools and Table furnished to me without extra cost.

Name ..... Age .....

Address .....

From Order Clerk *to* General Manager *in five years!*

Back in 1920, V. G. Powell of New York, was a young order clerk just out of the army—in 1924 he was directing sales and advertising—a year later he was general manager. In between were five years of capable, loyal service and two completed LaSalle training courses—Modern Business Correspondence and Business Management.

Six months after starting his first course, he asked to handle correspondence and got the job and a raise; a few months later he suggested a new sales promotion department and was given the responsibility of organizing and directing it; soon after he recommended the beginning of advertising and was given that task.

No wonder he moved up fast. Any employer would welcome and reward initiative and ability like that. Today he is the editor of his industry's magazine and an outstanding figure in that great field.

Note his own comment, "My two training courses gave me more than I could have gained through ten years of experience."

Send for the Salary-Increasing Plan That Powell Followed

What's to prevent your equalling Powell's records—setting new records of your own? You have the same twenty-four hours in the day—the same ambition to get ahead. Turn time into cash with the LaSalle salary-increasing plan. The coupon just below this text will bring you full particulars without the slightest obligation. Whether you adopt the plan or not, the basic information it will place in your hands, without cost, is of very real and definite value.

If a successful career is worth a 2c stamp and two minutes of your time, check the field of advancement that appeals to you, fill in your name and address, and place the coupon in the mail TODAY.

—— *Find Yourself Through La Salle* ——

LA SALLE EXTENSION UNIVERSITY

The World's Largest Business Training Institution

Dept. 12493-R Chicago

I should be glad to learn about your salary-increasing plan as applied to my advancement in the business field checked below.

- ☐ Business Management
- ☐ [illegible]
- ☐ [illegible]
- ☐ [illegible]manship
- ☐ Law: Degree of LL.B.
- ☐ Commercial Law
- ☐ Industrial Management
- ☐ Modern Foremanship
- ☐ Personnel Management
- ☐ Railway Accounting
- ☐ Railway Station Management
- ☐ Banking and Finance
- ☐ Modern Business Correspondence
- ☐ Expert Bookkeeping
- ☐ C. P. A. Coaching
- ☐ Business English
- ☐ Commercial Spanish
- ☐ Effective Speaking
- ☐ Telegraphy
- ☐ Credit and Collection Correspondence

Name... Age...

Present Position

Address

ANDY'S SHOP MAIL BOX

(Continued from page 14)

A gasoline powered ice-cutting machine made by Roy Karloske of Minneapolis, Minnesota.

axle by cables. The rear axle works in a guide. Two guides are also used after making the first cut and the width of the cut can be adjusted.

A Model T Ford chassis mounted on sled runners is the frame. The saw will cut ice at about the speed of a person walking and is shoved by hand.

Yours truly,
ROY KARLOSKE.

Some New Books

IT'S about time to be thinking of Christmas presents, so if any of the gang are fed up on ties and handkerchiefs, I suggest that you leave your copy of Double M open at this page where it can be read by those whom you can usually count on for gifts.

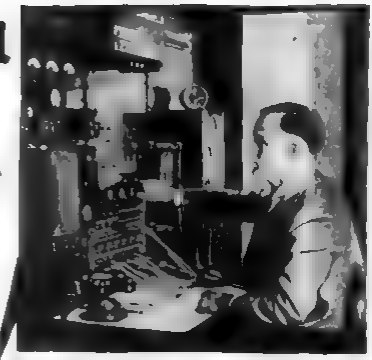
About the most appropriate gift I can think of for any Double M fan would be a copy of THE HANDY MAN'S HANDBOOK by C. T. Schaefer. It's a Harper publication and costs three bucks. Here are a few of the chapter titles:

Wood-cutting Tools—Their Care and Use, Hand Tools—Their Use and Abuse, Measuring Tools and Their Use, Wood Working and Wood Joints, Repairs to Woodwork, Plumbing Repairs, Electrical Wiring, Cement Work. That's only a starter, but it gives you a rough idea.

The particular contribution which this book provides is the selection, arrangement and treatment processes and operations of general interest and within the scope of even those of limited mechanical knowledge and ability. Much of the material contained in this book is similar to what you will find each month in Double M. Its particular

(Continued on page 20)

I will train you at home to fill a BIG PAY Radio Job!



If you are earning a penny less than $50 a week, send for my book of information on the opportunities in Radio. It is free. Clip the coupon NOW. Why be satisfied with $25, $30 or $40 a week for longer than the short time it takes to get ready for Radio?

Radio's growth opening hundreds of $50, $75, $100 a week jobs every year

In about ten years Radio has grown from a $2,000,000 to a $1,000,000,000 industry. Over 300,000 jobs have been created. Hundreds more are being opened every year by its continued growth. Many men and young men with the right training—the kind of training I give you—are stepping into Radio at two and three times their former salaries.

You have many jobs to choose from

Broadcasting stations use engineers, operators, station managers and pay $1,200 to $5,000 a year. Manufacturers continually need testers, inspectors, foremen, engineers, service men, buyers, for jobs paying up to $7,500 a year. Shipping companies use hundreds of Radio operators, give them world wide travel with board and lodging free and a salary of $80 to $150 a month. Dealers and jobbers employ service men, salesmen, buyers, managers, and pay $30 to $100 a week. There are many other opportunities too.

So many opportunities many N. R. I. men make $200 to $1,000 while learning

The day you enroll with me I'll show you how to do 28 jobs, common in most every neighborhood, for spare time money. Throughout your course I send you information on servicing popular makes of sets; I give you the plans and ideas that are making $200 to $1,000 for hundreds of N. R. I. students in their spare time while studying. My course is famous as the course that pays for itself.

Talking Movies, Television, Aircraft Radio are also included

Special training in Talking Movies, Television and home Television experiments, Radio's use in Aviation, Servicing and Merchandising Sets, Broadcasting, Commercial and Ship Stations are included. I am so sure that I can train you satisfactorily that I will agree in writing to refund every penny of your tuition if you are not satisfied with my Lessons and Instruction Service upon completing.

64-page book of information FREE

Get your copy today. It tells you where Radio's good jobs are, what they pay, tells you about my course, what others who have taken it are doing and making. Find out what Radio offers you, without the slightest obligation. ACT NOW!

J. E. SMITH, President
National Radio Institute, Dept. 1NH
Washington, D. C.

$100 a week

My earnings in Radio are many times greater than I ever expected they [illegible]. They seldom fall under $100 a week."
H. R. WINBORNE,
1267 W. 48th St.,
Norfolk, Va.

Jumped from $35 to $100 a week

"Before I entered Radio I was making $35 a week. Last week I earned $110 servicing and selling Radios. I owe my success to N. R. I."
J. A. VAUGHN,
3101 S. Grand Boulevard,
St. Louis, Mo.

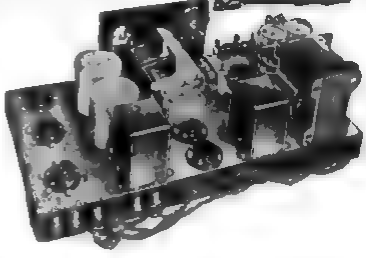
[illegible]

I find I made $500 from January to May in my spare time. My best week brought me $107. I should have taken it long ago.
HOYT MOORE,
R. R. 3, Box 919,
Indianapolis, Ind.

I will give You my new 8 OUTFITS of RADIO PARTS for practical Home Experiments

You can build over 100 circuits with these outfits. You build and experiment with the circuits used in Crosley, Atwater Kent, Eveready, Majestic, Zenith, and other popular sets. You learn how these sets work, why they work, how to make them work. This makes learning at home easy, fascinating, practical.

Back view of 5 tube Screen Grid A. C. set—only one of many circuits you can build.



I am [illegible] and tripling the [illegible] of many in one year and less. Find out about this quick way to

Radio Needs Trained Men

FILL OUT AND MAIL THIS COUPON TODAY

J. E. SMITH, President
National Radio Institute, Dept. 1NH
Washington, D. C.

Dear Mr. Smith: Send me your free book. I understand this request does not obligate me and that no salesman will call.

NAME.....

ADDRESS.....

CITY..... STATE.....

Time Employment Service to all Graduates

PATE

Protect Your Ideas

Take the First Step Today

If you have a useful, practical, novel idea for any new article or for an improvement on an old one, you should communicate with a competent Registered Patent Attorney AT ONCE. Every year thousands of applications for patents are filed in the U. S. Patent Office. Frequently two or more applications are made for the same or substantially the same idea (even though the inventors may live in different sections of the country and be entirely unknown to one another). In such a case, the burden of proof rests upon the last application filed. Delays of even a few days in filing the application sometimes mean the loss of a patent. So lose no time. Get in touch with me at once by mailing the coupon on the opposite page.

Prompt, Careful, Efficient Service

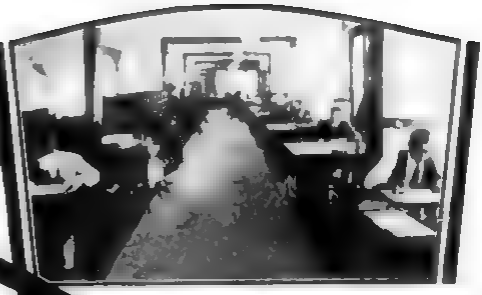
This large, experienced organization devotes its entire time and attention to patent and trade mark cases. Our offices are directly across the street from the U. S. Patent Office. We understand the technicalities of patent law. We know the rules and requirements of the Patent Office. We can proceed in the quickest, safest and best ways in preparing an application for a patent covering your idea. Our success has been built on the strength of careful, efficient, satisfactory service to inventors and trademark owners located in every state in the Union.

NO CHARGE for Information

On How to Proceed

The booklet shown here contains valuable information relating to patent procedure that every inventor should have. And with it I will also send you my "Record of Invention" form on which you can sketch your idea and establish its date before a witness. Such evidence may later prove valuable to you. Simply mail the coupon and I will send you the booklet, and the "Record of Invention" form, together with detailed information on how to proceed and the costs involved. Do this NOW. No need to lose a minute's time. The coupon will bring you complete information entirely without charge or obligation.

My Offices Just Across Street From U. S. Pat. Office



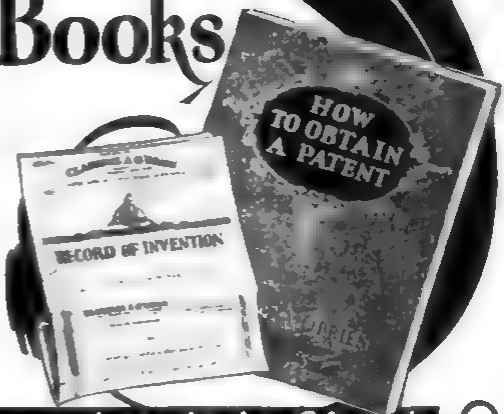
NTS

Above is a view of my drafting and specification offices where a large staff of experienced experts are in my constant employ. All drawings and specifications are prepared in my offices.

Inventors Write for these Free Books

Strict Secrecy Preserved

All communications, sketches, drawings, etc., are held in strictest confidence in strong, steel, fireproof files, which are accessible only to authorized members of my staff. Feel free to write me fully and frankly. It is probable that I can help you. Highest references. But FIRST—clip the coupon and get my free book. Do THAT right now.



Clarence A. O'Brien

Registered Patent Attorney

Member of the Bar of The Supreme Court of the United States, U. S. Court of Customs and Patent Appeals, U. S. Court of Claims, Court of Appeals, District of Columbia and Supreme Court of the District of Columbia

Practice confined exclusively to Patents, Trademarks and Copyrights

Clip this Coupon *and* Mail it *Now!*

CLARENCE A. O'BRIEN, *Registered Patent Attorney*

317-E, Security Savings and Commercial Bank Building
WASHINGTON, D. C.
(or, Suite 1106 Woolworth Bldg., Dept. C-18, New York City)

Please send me your free book, "How to Obtain a Patent," and your "Record of Invention" form without any cost or obligation on my part.

Name .....

Address .....

(Important—Write or print plainly, and address office nearest you)

THERE'S ROMANCE IN RADIO!

become a part of it . . enter aircraft radio . . broadcast station or studio . . direction finder and radio compass . . disc and film recording . . talking pictures . . servicing of home entertainment equipment . . television

Seek advancement, adventure, excitement in 7 thrilling branches of one of today's fastest growing industries

ARE you looking toward the future? Consider radio. Men who know agree it has in store a tremendous future. Adventure, excitement and advancement are in store for many. But —only those who are qualified will forge ahead with the industry!

Learn any of the 7 thrilling branches of radio listed above. Now you can get this training at RCA Institutes. Four resident schools at New York, Boston, Philadelphia and Chicago offer elementary and advanced courses in practical radio. Courses based on 22 years experience. And, of equal importance, these schools are associated with the largest, most complete research laboratory in the radio industry.

Win Radio Scholarship

If you cannot attend the resident schools, RCA Institute Extension Courses enable you to study at home. Special laboratory equipment furnished. Outstanding graduates of extension courses become eligible for free scholarship at nearest resident school. All tuition costs moderate. Write today for free catalog. The coupon makes it easy.

RCA INSTITUTES, Inc.

RCA Institutes, Inc., Dept. MC12, 75 Varick Street, N. Y.
Gentlemen: Please send me your General Catalog. I am checking below the phase of radio in which I am particularly interested.

☐ Aircraft Radio
☐ Broadcast Station or Studio
☐ Talking Pictures
☐ Direction Finder and Radio Compass
☐ Disc and Film Recording
☐ Servicing Home Entertainment Equipment
☐ Television

Name _____
Address _____
Occupation _____ Age _____

ANDY'S SHOP MAIL BOX

(Continued from page 16)

value lies in the fact that it is so arranged that it is instantly available for ready reference. If you like this magazine you will like this book.

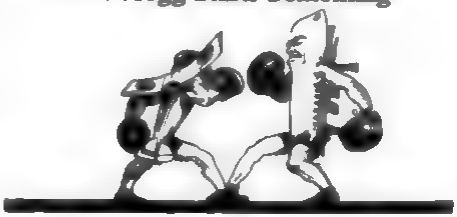
Dick Grace, who has been a fairly regular contributor to the pages of MODERN MECHANICS AND INVENTIONS has recently burst into print again with a book which is aptly titled I AM STILL ALIVE.

The author, who makes his living by risking his neck that he might furnish thrills to movie-goers, wields a wicked typewriter; and having lived through the thrilling adventures described on the pages of this book, he is able to make them sound much more convincing than if they had been passed on to you second hand. The fellow who flies his own plane might get some interesting tips from this book as to how to crack up without going to the hospital. The volume is published by Rand McNally & Company of Chicago.

Captain E. Armitage McCann, Master Mariner and the foremost authority on ship models, has followed his first volume, HOW TO MAKE WORTH-WHILE MODELS, with two other books of even greater value. The titles of these books are SHIP MODEL MAKING.

Volume II deals with two models, the Barbary pirate felucca and the Spanish galleon. Volume III is devoted entirely to the U. S. S. *Constitution*. Both books are profusely illustrated with detail drawings, while full-size plans are contained in a back-cover pocket. The Norman W. Henley Publishing Company of New York asks $2.50 for each volume.

Mr. Hogg Starts Something

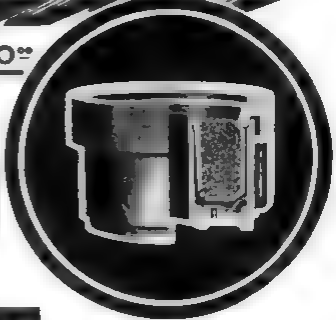


DID you read John Edwin Hogg's recent article, Back Talk from the Navy? Did you get all hot and bothered about it? Yes?

(Continued on page 22)

OIL HEAT

FULLY AUTOMATIC - NOW LESS THAN $100



CHEAP AS COAL

Now you can actually SAVE MONEY ON FUEL BILLS, yet enjoy carefree, automatic oil heat—at the lowest prices on the easiest terms ever offered. Less than ever before—LESS THAN $100. Operates more economically. The famous Laco Removable Gas Generating Chamber—changes oil into gas—eliminates all fuel waste—gets more heat from every dollar's worth of oil. It's ACTUALLY AS CHEAP AS COAL. Built of finest materials. Simple. Only one moving part. Fits instantly into your present heating system. Only a few hours to install. Seldom needs service.

CLEAN . . . AUTOMATIC . . . QUIET

There's no smoke, soot, grease or odor. Runs so quietly your guests never hear it. Completely automatic. Room Thermostat and all latest safety features. Attractively finished.

SPECIAL OFFER—Send at once for our SPECIAL 1931 OFFER, complete information, and low prices—less than $100. SPECIAL EASY PAYMENT PLAN if you write now. No obligations. Send immediately. Tell us number rooms you want to heat and present heating system.

Dealers Wanted

The opportunity of a lifetime to get in on the ground floor. SPECIAL DEALER OFFER now open in rich fields. No experience needed. Small investment. No service work. Dealers report as much as $5,000 to $50,000 yearly profits. Write today for SPECIAL FALL OFFER.

Listed as Standard by Underwriters Laboratories

NEW REMOVABLE GAS GENERATING CHAMBER

Now burns longer with less attention—smashes fuel costs by eliminating all waste. As oil rises up the asbestos wick, it is MIXED WITH AIR and turned into hydro-carbon gas. The gas burns in suspension—not the oil in its original form. That's why LACO SAVES YOU MONEY ON FUEL BILLS. Now burns either oil or gas (natural or manufactured). Write for complete story of the Laco Mineral Wick and other amazing new features.

26 SIZES AND MODELS

LACO OIL BURNER CO. 2028 Union Street GRISWOLD, IOWA U. S. A.

1000 HOTEL POSITIONS OPEN!

HOTEL, club, restaurant and institutional field calling for trained men. Thousands of positions as Manager, Assistant Manager, Steward, Room Clerk, Auditor, Sports Director and other important positions paying $2,500 to $10,000 a year, open annually. Nearly $1,000,000,000 worth of NEW HOTELS, CLUBS, SCHOOLS, HOSPITALS and INSTITUTIONS being built this year. Lewis-trained men start at salaries up to $2,500 a year, with living often included.

Previous Experience Proved Unnecessary

Qualify for a well-paid position at home in spare time—our Personal Coaching Plan adapts training to your needs. Lewis-trained men of both young and mature age winning success. Lewis Training qualified George Rogers, 54, for a well-paid position. A good grade-school education, plus Lewis Specialized Training, qualifies you.

Nationwide Employment Service Free of Extra Charge

All of your training under personal supervision of Clifford Lewis, who was appointed Managing Consultant by over 300 hotels. Registration FREE of extra cost in our National Employment Bureau, covering country at 70,000 points through special arrangement with Postal Telegraph. Send today for Free Book "Your Big Opportunity," explaining our Money-back Agreement and our Personal Coaching Plan.

LEWIS HOTEL TRAINING SCHOOLS

Room DW-9101 CLIFFORD LEWIS, President, Washington, D. C.

BE A HOTEL MAN! Hotels, Clubs, Apartment Hotels, etc., calling for Managers, Assistant Managers, Stewards, etc.

Proof

Our files contain hundreds of letters like these which prove that the hotel industry is the field of big opportunity today. "Not a few years ago I had never even entered a hotel. Now I am holding the position of Steward at this Inn, due to your course. Thomas M. Bass. "Have been Asst. Manager of this hotel for three months and find my Lewis training of greater benefit every day." "

Lewis Hotel Training Schools,
Room DW-9101, Washington, D. C.

Send me the Free Book, "YOUR BIG OPPORTUNITY," without obligation, and details of your Personal Coaching Plan.

Name . . . . . .

Address . . . . . .

City . . . . . State . . . .

OPPORTUNITY COUPON

"You won't be laid off!"

"It's tough when fellows get laid off. They've been cutting down some at our plant and everybody has been worried, wondering where the axe would fall next.

"It made me feel mighty good yesterday when the boss stopped and said he had a better job in mind for me. 'It's trained men like you we need around here,' he said, 'and it's too bad we must let some of the untrained go. If those fellows had used the foresight you did, and studied with the International Correspondence Schools, we'd be mighty glad to keep them too. Trained men never need to worry about their jobs around here!'"

● ● ●

Today, in all parts of the world, through training supplied by the International Correspondence Schools, thousands of men have made themselves so valuable that promotions and raises come to them regularly. In this modern age, it is the trained man who goes ahead! You can become a trained man! Why not find out how?

Just mark and mail the coupon today

INTERNATIONAL CORRESPONDENCE SCHOOLS
"The Universal University"
Box 2323-M, Scranton, Penna.

Without cost or obligation, please send me a copy of your booklet, "Who Wins and Why," and full particulars about the subject before which I have marked X:

TECHNICAL AND INDUSTRIAL COURSES

☐ Architect	☐ Automobile Mechanic
☐ Architectural Draftsman	☐ Plumbing ☐ Steam Fitting
☐ Building Estimating	☐ Heating ☐ Ventilation
☐ Wood Millworking	☐ Sheet Metal Worker
☐ Contractor and Builder	☐ Steam Engineer
☐ Structural Draftsman	☐ Steam Electric Engineer
☐ Structural Engineer	☐ Civil Engineer
☐ Electric Wiring	☐ Surveying and Mapping
☐ Electrical Engineer	☐ Refrigeration
☐ Electric Lighting	☐ R. R. Locomotives
☐ Welding, Electric and Gas	☐ R. R. Section Foreman
☐ Reading Shop Blueprints	☐ R. R. Bridge and Building Foreman
☐ Telegraph Engineer	☐ Air Brakes ☐ Train Operation
☐ Telephone Work	☐ Highway Engineering
☐ Mechanical Engineer	☐ Chemistry ☐ Pharmacy
☐ Mechanical Draftsman	☐ Coal Mining Engineer
☐ Machinist ☐ Toolmaker	☐ Navigation ☐ Boilermaker
☐ Patternmaker	☐ Textile Overseer or Supt.
☐ Pipefitter ☐ Tinsmith	☐ Cotton Manufacturing
☐ Bridge Engineer	☐ Woolen Manufacturing
☐ Bridge and Building Foreman	☐ Agriculture ☐ Fruit Growing
☐ Gas Engines ☐ Diesel Engines	☐ Poultry Farming ☐ Radio
☐ Aviation Engines	☐ Marine Engineer

BUSINESS TRAINING COURSES

☐ Business Management	☐ Business Correspondence
☐ Office Management	☐ Lettering Show Cards ☐ Signs
☐ Industrial Management	☐ Stenography and Typing
☐ Personnel Management	☐ Complete Commercial
☐ Traffic Management	☐ Civil Service ☐ Mail Carrier
☐ Accountancy ☐ Cost Accountant	☐ Railway Mail Clerk
☐ C. P. Accountant	☐ Grade School Subjects
☐ Bookkeeping	☐ High School Subjects
☐ Secretarial Work	☐ College Preparatory
☐ Spanish ☐ French	☐ Illustrating ☐ Cartooning
☐ Salesmanship ☐ Advertising	☐ Lumber Dealer

Name .... Age ....

Address ....

City .... State ....

Occupation ....

If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada

ANDY'S SHOP MAIL BOX

(Continued from page 20)

Well, so did a few other aviation boosters. Let's have the argument out right here and now.

Flushing, N. Y.

Ye Eds, M. M.

Gentlemen:

I have no doubt that Lieut. Hogg knows his Navy, but am I wrong in assuming he is referring to bombers of the Keystone Panther and Curtiss Condor type? Relatively slow and inefficient bombing platforms, what? Both of these types should not be considered.

What about the Boeing Death Angel, the Martin Diving Bomber and the Curtiss Helldiver type F8 C-5? Both types can get a bomb of 1,000 pounds into the air, carry it with lots of altitude at a speed of 180 miles an hour and diving bombers are accurate in hitting their targets.

The explosion of 1,000 pounds of wallop alongside Germany's new pocket battleship would cause plenty of excitement that the crew wasn't anxious to get. I believe that said pocket battleship is much more "bomb-proof" than our big boys. Battle wagons still have condensing systems in their innards, too, quite easily damaged, I understand.

True enough that aircraft are limited in their cruising radius, but why not the more efficient fast cruiser, destroyers, and more aircraft carriers with the right kind of aircraft?

Anti-aircraft is a nice way to waste ammo on fast airplanes. I witnessed target practice on a tow target towed by a Falcon, Liberty powered, with a speed of approximately 145 miles an hour at altitudes ranging from 5,000 to 18,000 feet. No hits were made by battery on target in afternoon's practice, although the most modern range-finding devices were used.

Let Lieut. Hogg take his pet battle wagon to sea and give me a good peelot (Yes, I'd take a crack at it myself and I just stagger around upstairs), a F8C-5, let said battle wagon cut loose and me go after it. Trying to hit a diving ship going 350 miles an hour or over is like trying to put to sea in a sieve for a non-stop trip to Europe. I'm sure handing out laughs.

Your mag is great,

L. HAWK TARBOX.

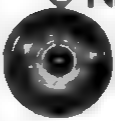
Clang! The bell sure saved the Navy that time. That round goes to the Hawk by a big margin. But the battling gob is a tough hombre. He's getting his instructions from his seconds, and there's a wicked gleam in his eye as he paws the resin while waiting for the second round. Bong! They're at it again!

(Continued on page 24)

EXPO WATCH CAMERA

SEND ONLY $1

No bigger than a watch. Makes marvelous, sharp pictures 5/8"x7/8", that can be enlarged up to 3¼"x4¼". No focusing. Press the button and the picture is yours. "Time" and "Instantaneous" shutter. Loads in daylight. 20 exposure film costs only 30 cents. Send $1 for camera and film. Pay postman $4 plus postage. Money back guarantee. Send today.



NEW CENTRAL BAROMETER

Genuine aneroid construction. Forecasts the weather 12 to 24 hours in advance. Finely made. A precision instrument in every way. Should be in every home. 3½ inches in diameter. Only $2.95 for limited time. Send $1. Pay postman $1.95 plus postage.

SEND ONLY $1

Hawkeye 2A Only $9.95

With 2 Rolls of Film

This genuine Eastman Camera has very fine Double Rapid Rectilinear Lens. Makes pictures 2½x4¼ inches so sharp and clear, they may be enlarged to most any size. Collect big *profit* on pictures of houses, pets, etc., made for friends. Act today and get a

FREE DEVELOPING AND PRINTING OUTFIT

During this offer you get 4 Trays, big supply of Developer and Fixer, Ruby Lamp, Stirring Rod, Graduate, 6 doz. sheets of Printing Paper, Printing Frame and FULL INSTRUCTIONS—all FREE! Satisfaction GUARANTEED SEND ONLY $1. Pay postman $8.95 plus few cents postage when outfit arrives. Order now. Send $1 today.

PENCIL MICRO-SCOPE

ONLY $1

An excellent microscope magnifying 25 diameters yet is no larger than a fountain pen. For engineers, inspectors, custom officers, jewelers, watchmakers engravers. Also for botanists, zoologists, dentists physicians and students. Only $1 complete. Send today.

WOLLENSAK BIASCOPE

SIX POWER

SEND ONLY $1

For bird students, tourists and theatre goers. A very fine glass. Six power. Precision adjustments. Compensates for pupillary differences. Regularly $5. Special, with pingrain leather case, only $3.95. Send $1. Pay postman $2.95 plus postage. Satisfaction guaranteed.

Send for Bargain Book

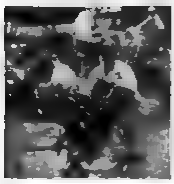
24 pages of photo and optical bargains. Foreign and domestic cameras and equipment. All illustrated, fully described, and offered on 10 day trial with a money back guarantee. Send today.

CENTRAL CAMERA CO.

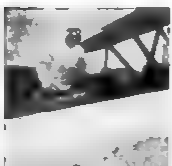
230 S. Wabash Ave. Dept. 19C Chicago

In the Air ...*and on the Ground*

LINCOLN-TRAINED MEN GET THE BEST AVIATION JOBS!



Studying Engines



After His First Solo

Twelve years of remarkable success has made Lincoln the world's best known Aviation school. Aviation executives have learned that Lincoln produces the best-trained Mechanics and Pilots. So they prefer Lincoln-Trained men! Give them the most responsible, best-paying positions!

Lincoln Mechanics learn on real ships under actual factory standards, as we are connected with large airplane factory. Pilots learn on 4 distinct types of planes. Also Welding and Radio Courses.

Ground and Flying School hold highest Government approval. Government-licensed instructors. $250,000 worth of buildings and equipment. $100,000 airport. Reasonable tuition. Part time jobs to help pay room and board while in training.

Instruction Also in Spanish.

LINCOLN AIRPLANE & FLYING SCHOOL
401A Aircraft Bldg. Lincoln, Nebr.

Bigger Pay . . . "After graduation, I immediately secured a position in an airplane factory that paid more at the beginning than my former railroad job paid after 5 years."—D. Applebee.

Two Offers . . . "I now have two very flattering offers as pilot, both at very substantial salaries."—Evelyn Nicholas.

Good Salary . . . "After finishing at Lincoln, I received a position as a mechanic and assistant to the director, at a good salary."—J. K. Weigel.

CATALOG AN HEIGHT

Contains complete information about Lincoln School. Lists reasonable tuition costs. Gives details of part time employment offer to help students pay room and board while in training. Mail coupon today!

MAIL THIS COUPON

LINCOLN AIRPLANE & FLYING SCHOOL
401A Aircraft Bldg., Lincoln, Nebr.

Gentlemen. Please send me your catalog, "Aviation Beckons You," containing full information about the Lincoln School and reasonable tuition.

I am interested in:

☐ Flying Course ☐ Welding Course
☐ Radio Course ☐ Mechanical Course

Name ..... Age.....
Address.....
City .....

LEARN AVIATION AT LINCOLN...WHERE LINDBERGH LEARNED

$1,000 Reward

For the Capture of This Man

CONVICT 6138, escaped from the State Penitentiary; Name, Charles Condray; age 37; Height, 5 feet 8 inches, Weight, 141 pounds; Hair, light brown; Eyes, gray.

Easy enough to identify him from his photograph and this description, you may say — but, Condray took the name of "Brown," dyed his hair, darkened his skin, grew a mustache, put on weight and walked with a stoop.

Yet he was captured and identified so positively that he knew the game was up and returned to the penitentiary without extradition. How was it accomplished? Easy enough for the Finger Print Expert. They are the specialists, the leaders, the cream of detectives. Every day's paper tells their wonderful exploits in solving mysterious crimes and convicting dangerous criminals.

More Trained Men Needed

The demand for trained men for government bureaus, cities, detective agencies, corporations, and private business is becoming greater every day. Here is a real opportunity for YOU. Can you imagine a more fascinating line of work than this? Often life and death depend on finger print evidence—and big rewards go to the expert. Many experts earn regularly $5,000 and more per year.

Learn At Home in Spare Time

And now you can learn the secrets of this science at home in your spare time. Any man with common school education and average ability may become a Finger Print Detective in surprisingly short time.

FREE The Confidential Reports No. 38 Made to His Chief!

IF YOU ACT QUICK—We will send you free and with no obligation whatsoever, a copy of the gripping, fascinating, confidential report Secret Service Operator No. 38 made to His Chief. Mail coupon NOW!

Write quickly for fully illustrated free book on Finger Prints which explains this wonderful training in detail. Don't wait. Mail the coupon now. You may never see this announcement again! You assume no obligation! You have everything to gain and nothing to lose. Write at once. Address

Institute of Applied Science
Dept. 23-59 1920 Sunnyside Av., Chicago

INSTITUTE OF APPLIED SCIENCE,
Dept. 23-59 1920 Sunnyside Ave., Chicago

Gentlemen: Without any obligation whatever, send me your new, fully illustrated, FREE book on Finger Prints and the free copy of the Confidential Reports Operator No. 38 made to His Chief. Literature will NOT be sent to boys under 17 years of age.

Name .....

Address .....

..... Age .....

ANDY'S SHOP MAIL BOX

(Continued from page 22)

Miles City, Montana.

Publishers:

You are performing a tremendously important service for the U. S. in publishing the Navy's side of the plane-sub-battleship controversy. As an American who has read his country's history, I can think of few subjects more vital.

How American fathers can sit silently by and, seeing the lives of young men nipped in the bud as they have been through the ignorance of congressmen and the asininity of pacifist cabinet officers, refrain from making themselves heard in a way that will never permit such things happening again, is beyond my comprehension.

Your invitation to express an opinion is in itself an unusual thought and an act of patriotism and usefulness.

It would seem impossible that any American schoolboy who has read of the inestimable services of our navies—or those of our allies (as the French at Yorktown)—of the Monitor, of the fleet at Santiago, in the Philippines, of the Constitution, on Lake Erie, at Vicksburg, and in the World war—could not understand the importance of battleships.

I have used your article already among a few professional gentlemen friends who have been deluded by the General Mitchell propaganda, and with whom I have had several heated arguments; as I consider their views nothing less than suicidal for the country and murderous for those who may have to fight.

If you will pardon a personal reference, the writer of this letter, prior to the World war outbreak, when things were threatening, suggested through the columns of a newspaper by which he was employed that it would be profitable for the U. S. to spend a billion dollars for 50 first class battleships to preserve American neutrality. Of course nobody paid any attention to such a wild thought. Well, it might have saved us some money, if one will stop and figure out just what our being forced into the war because Germany was NOT AFRAID OF US did cost.

Yours truly,
JOHN SMITH.

Well, ol' boy, ol' boy, ol' boy, that sort of evens things up. I'm sorry, but decisions are not permitted in this state. You'll have to be the judge yourself.

Before ending this argument, however, I just can't resist the temptation to call to your attention the fact that on August 14th the Army bombers went out to sink the old and decrepit *Mount Shasta* which was anchored off the Virginia Capes. Although knowing the approximate location, the

(Continued on page 32)

Who else wants to learn to play....

at home without a teacher, in ½ the usual time and ⅓ the usual cost?

Over 600,000 men and women have learned to play their favorite instruments the U. S. School of Music way!

That's a record of which we're mighty proud! A record that proves, better than any words, how *thorough*, how *easy*, how *modern* this famous method is.

Just think! You can quickly learn to play any instrument—directly from the notes—and at an average cost of only a few cents a day.

You study in your own home, practice as much or as little as you please. Yet almost before you realize it you are playing real tunes and melodies—not dull scales, as with old-fashioned methods.

Like Playing a Game

The lessons come to you by mail. They consist of complete printed instructions, diagrams, and all the music you need. You simply can't go wrong. First you are *told* what to do. Then a picture *shows* you how to do it. Then you do it yourself and *hear* it. No private teacher could make it any clearer.

As the lessons continue they become easier and easier. For instead of just scales you learn to play by *actual notes* the favorites that formerly you've only *listened* to. You can't imagine what fun it is, until you've started!

Truly, the U. S. School method has removed all the difficulty, boredom, and extravagance from music lessons.

Fun—Popularity

You'll never know what real fun and good times are until you've learned to play some musical instrument. For music is a joy-building tonic—a sure cure for the "blues." If you can play, you are always in demand, sought after, sure of a good time. Many invitations come to you. Amateur orchestras offer you wonderful afternoons and evenings. And you meet the kind of people you have always wanted to know.

Never before have you had such a chance as this to become a musician—a really good player on your favorite instrument—without the deadly drudging and prohibitive expense that were such drawbacks before. At last you can start right in and *get somewhere*, quickly, cheaply, thoroughly.

Here's Proof!

"I am making excellent progress on the 'cello—*and owe it all to your easy lessons*," writes George C. Lauer of Belfast, Maine.

"I am now on my 12th lesson and can already play simple pieces," says Ethel Harnishfeger, Fort Wayne, Ind. *"I knew nothing about music when I started."*

"I have completed only 20 lessons and *can play almost any kind of music I wish*. My friends are astonished," writes Turner B. Blake, of Harrisburg, Ill.

And C. C. Mittlestadt, of Mora, Minn., says, "I have been playing in the brass band for several months now. I learned to play from your *easy lessons*."

You, too, can learn to master the piano, violin, 'cello, saxophone—any instrument you prefer—this quick, easy way! For every single thing you need to know is explained in detail. And the explanation is always *practical*. Little theory—plenty of *accomplishment*. That's why students of the U. S. School course get ahead *twice as fast* as those who study by old-fashioned, plodding methods.

Pick Your Instrument

Piano	Violin
Organ	Clarinet
Ukulele	Flute
Cornet	Saxophone
Trombone	Harp
Piccolo	Mandolin
Guitar	'Cello

Hawaiian Steel Guitar
Sight Singing
[illegible]
[illegible]
[illegible]
Voice and Speech Culture
Harmony and Composition
Drums and Traps
Automatic Finger Control
Banjo (Plectrum, 5-String or Tenor)
Juniors' Piano Course

Booklet and Demonstration Lesson—FREE!

The whole interesting story about the U. S. School course cannot be told on this page. A booklet has been printed, "Music Lessons in Your Own Home," that explains this famous method in detail, and is yours free for the asking. With it will be sent a Free Demonstration Lesson, which *proves* how delightfully quick and easy—*how thorough*—this modern method is.

If you really want to learn to play at home—without a teacher—in one-half the usual time—and at one-third the usual cost—by all means send for the Free Booklet and Free Demonstration Lesson AT ONCE. No obligation. (Instruments supplied if desired—cash or credit.) U. S. SCHOOL OF MUSIC, 26212 Brunswick Bldg., New York.

Thirty-Fourth Year (Estab. 1898)

U. S. SCHOOL OF MUSIC,
26212 Brunswick Bldg., New York City

Please send me your free book, "Music Lessons in Your Own Home," with introduction by Dr. Frank Crane, Free Demonstration Lesson and particulars of your easy payment plan. I am interested in the following course:

..... Have You Instrument? .....

Name .....

Address .....

City ..... State .....

These books will qualify you for a big-pay job!

The American Machinists' Library—six big volumes packed to the covers with sound, pay-raising information—puts training right within your arm's reach. The books are the last word on modern machine shop practice—the most complete, the most thorough, the most practical set of books ever published in this field. Use them to increase your earning power—to win promotion!

AMERICAN MACHINISTS' LIBRARY

6 volumes—2,000 pages—2,500 illustrations

A combined home-study course and reference library.

The American Machinists' Library gives you every bit of information you need to progress in tool and gage work—machine tool operation—jigs and fixtures—punches and dies—working of steel—in fact everything that will help you win your way to the top in machine shop work

These books give you exact information regarding the principles involved in operating lathes, drills, hand and automatic screw machines, planers, boring machines, milling machines, etc. They tell you how to operate these machines expertly. Just the kind of information you need!

They offer you the practical knowledge required by die makers, tool makers, and tool draftsmen for the efficient design and construction of punches and dies, master plates, jigs and fixtures, gages, etc. They more than tell you "how" to do it—they tell you "why" it should be done in the one best way. And it's the fellows who know "why" as well as "how" who fill the bigger positions in the machine shop world.

No Money down··· 8 Months to pay

On receipt of the coupon we will send the books to you, all charges postpaid. You look them over for ten days. If you like them—send us your first payment of $1.50. The balance you pay at the rate of $2.00 a month until $17.50, the special price of the set has been paid.

Clip and mail this coupon—NOW

FREE EXAMINATION COUPON

McGRAW-HILL BOOK CO., Inc., 370 Seventh Ave., New York

Send me for 10 days' free examination the AMERICAN MACHINISTS' LIBRARY. If satisfactory, I will send $1.50 in 10 days and $2 monthly until the special price of $17.50 is paid. If not wanted, I will return the books.

Signed .....

Address .....

City and State .....

Position .....

Company ..... M.M. 12-31

A NEW THRILL! in The Spy Master

The first and only novel of the heroic First Division, this new story by the author of "Spy X-44" and "The Conquest of America" will grip you with its authentic portrayal of action and thrills undergone by the "Fighting First."

BY

FREDERICK C. PAINTON

in the December

Fawcett's **Battle Stories**

Other features include: a thrill-packed, complete novelet, "Death Cargo" by ARTHUR GUY EMPEY; "The Devil's Recruits" by L. B. McNICOL; "Free Lance Soldiers" by FRANK HUNT RENTFROW; "Stokes Mortars, Forward!" by HAROLD F. CRUICKSHANK; "The Ghost Patrol" by HERBERT L. McNARY; "Artillery Guys" by MAJOR T. A. B. DITTON. Also, Pete McCoy, survivor of the old Hatfield-McCoy feud, tells how he won the D.S.C.

HERE IS A TIP--

Give a year's subscription to a friend for Christmas!

Price 25c At All News Stands

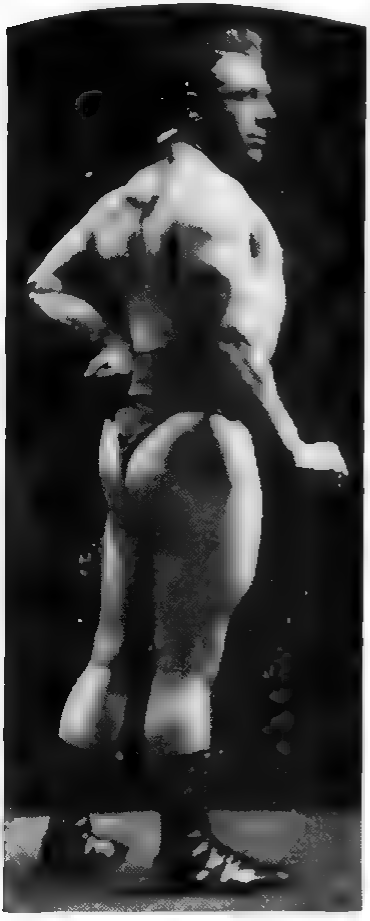
■ ■ ■

If your news dealer is sold out send 25 cents to Battle Stories Magazine, 529 7th St. So., Minneapolis, Minn., and a copy of the December issue will be mailed to you at once.

Strong Men Are Not Born

THEY ARE MADE!

I Develop Muscular Giants —I Can Make You Strong



GEORGE F. JOWETT
Champion of Champions

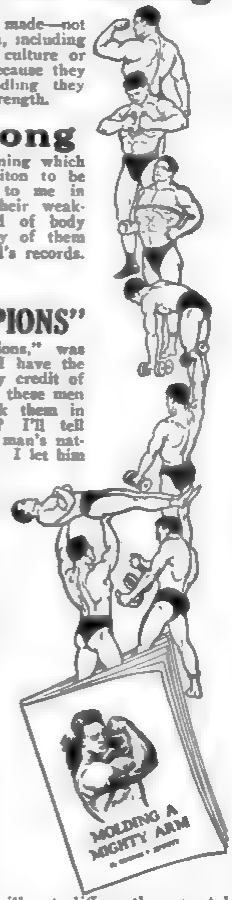
It is a proven fact that strong men are made—not born. Many of today's famous strong men, including myself, were forced to take up physical culture or some form of exercise for their health, because they were physical wrecks. With proper handling they soon developed into veritable giants of strength.

You Can Be Strong

I have perfected a system of mail training which permits anyone to realize his life's ambition to be strong and muscular. Men have come to me in despair because they were ashamed of their weaknesses—needless to say with my method of body building they quickly improved and many of them developed into strong men who broke world's records.

They Call Me "The CHAMPION of CHAMPIONS"

The title, "The Champion of Champions," was given to me by the men I have made. I have the longest list of champion strong men to my credit of any muscle builder in the world. Some of these men at first seemed hopeless yet after I took them in hand they became world beaters. Why? I'll tell you the reason. I do not try to change a man's natural self or nag him about what not to do. I let him follow his own individual taste and tell him what he should do. In other words, I give him the "know how" of getting strong and doing feats of strength. Regardless of what condition you are now in I know I can help you. My system never fails. I will make you fit and peppy. I will give you the body that you want and that nature intended you to have so that you can be popular and be sought after by both sexes. I will satisfy your hunger for love, strength and happiness. My proven method which has made hundreds of men happy, healthy and strong, will do the trick without hard work or inconvenience. Don't wait another minute! Don't envy strong, healthy, popular men. Come to me! I will give you a body to be proud of. I work with you by mail and perform this miracle without interfering with your daily routine. Every week I visit you by sending instructions which take you step by step into a new world. When I get through with you, you will have a body to be proud of—you will have muscles like mine with a grip of steel and the strength to easily do feats that now seem impossible. From the first lesson you will notice the pickup and difference, you will walk differently—you will act differently—you take on that feeling of assurance that you are "there." Let me prove my method never fails—take me up on my special test offer!



Lend Me Your Body for 90 Days
TEST COURSE - 25c

I'm positive I can help you! I'll prove it to you! I have prepared six special courses which are listed in the coupon. Each specializes in molding a definite part of the body. I don't ask you to enroll or sign for my full course now! I know you will do that later, if you will try a test course now. Each test course is a complete course covering the subject it's written about. You'll be amazed at the results in 30 days. You'll be dazzled in 90 days. Pick out your course now—rush coupon with only 25c, or if you want all six attach $1.00 to coupon and get them all.

Jowett Institute of Physical Culture
Dept. 37Za, 422 Poplar Street, Scranton, Pa.

I accept your offer. Send, by return prepaid mail, the courses checked below for which I enclose .....

☐ All 6 Courses $1.00.

☐ Molding A Mighty Arm 25c.
☐ Molding Mighty Legs 25c.
☐ Molding A Mighty Back 25c.
☐ Molding A Mighty Chest 25c.
☐ Molding A Mighty Grip 25c.
☐ Strong Man Stunts Made Easy 25c.

Name..... Age. .

Address . .. .

New 1932 *Delta*
Motor-Driven Units

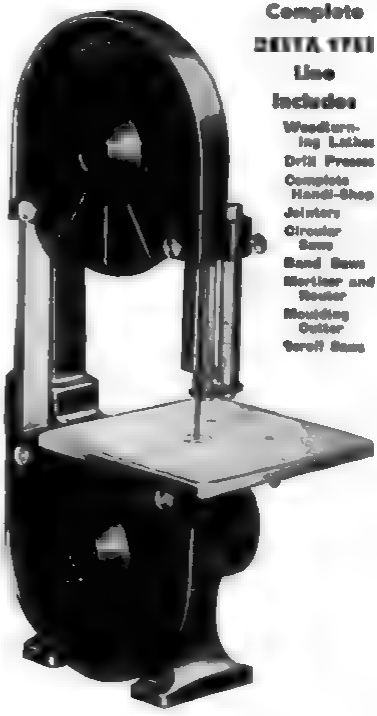
THIS SEASON Delta announces new "Quality" Motor-Driven Tools of extraordinary interest to those who work with wood for hobby, spare-time earnings, or production work. The entire Delta line has been greatly enlarged and now includes new tools of almost sensational performance finally perfected after years of careful development and testing. ***While new low 1932 prices prevail throughout, the high Delta standards of workmanship, efficient design, and quality materials have been everywhere rigidly maintained.*** Delta still offers the most machine value per dollar. Delta quality still pays in the end! Send coupon on next page for FREE catalog giving full details on complete Delta line.

New Delta
BAND SAW

Smooth running — Efficient — Safe. Ball-bearings throughout, including the blade guide. Fully guarded in every way. Graduated tilting table. Surprisingly low priced.

New Delta
DRILL PRESS

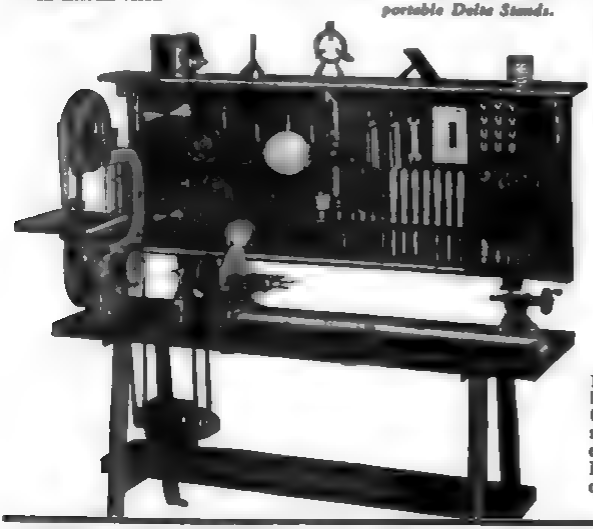
Large capacity. Ball-bearing throughout. Automatic leveling, accurate tilting table. Many special features — an unusual value.



Complete DELTA 1932 Line Includes

- Woodturning Lathes
- Drill Presses
- Complete Handi-Shop
- Jointers
- Circular Saws
- Band Saws
- Mortiser and Shaper
- Moulding Cutter
- Scroll Saws

Both Drill Press and Band Saw can be mounted on convenient, portable Delta Stands.



Complete Delta
COMBINATION SHOPS

Here illustrated is the Delta "De Luxe" Combination Shop — a complete woodworking shop that includes 4-speed lathe, band saw, circular saw and jointer — all mounted on bench and convenient, portable Delta stands. Delta Motor-Driven Tools are available in a large variety of combinations and prices to fit all needs.

DELTA SPECIALTY CO. (Division of Delta Mfg. Co.)
3775 N. Holton Street, Dept. M-1231, Milwaukee, Wisconsin

See Next Page for Coupon ➡

New Fields Open *for* Woodworkers

Delta **Quality Motor-Driven** Tools save time, money and labor. They take all the drudgery out of woodworking. They enable you to turn out better work in less time. They bring the finest professional cabinet work within the reach of all. Their compactness and practicability, their convenience and low prices, make these motor-driven tools ideal for both production work and home craftsmanship.

Thousands of Delta users report that Delta machines quickly pay for themselves. Delta equipment is being used today in home workshops, in farm shops, in factories for production work, by contractors and carpenters—in all fields where popular-priced but efficient woodworking tools are needed.

New Delta Scroll Saw

A truly amazing tool! Runs at full motor speed —1800 strokes per minute! Extra-smooth operating. Automatically oiled. 24-inch throat capacity. Rigid frame. Has many unusual features. Numerous uses such as filling, boning, sanding, etc. Sets new standards in scroll-saw performance. Investigate!

TEN-DAY TRIAL

EASY TERMS

Because Delta Tools are efficient and practical under actual working conditions, they are always available for a 10-Day Trial without the slightest risk. Satisfaction is guaranteed. For full details of this liberal offer, and also of convenient Easy Payment Plans, send the coupon below TODAY!

Send for FREE Catalog

Everything for the modern woodworker—professional, spare-time, or hobbyist—is illustrated and described in this big 1932 Delta Catalog. Send Coupon now for your copy.

Boring, Routing, and Mortising Attachment child's play out of difficult mortising operations.

Jointer and Circular Saw

Combination Unit. Each tool can be operated separately or both together. No interference. Furnished with or without motor.

DELTA SPECIALTY CO. (Division of Delta Mfg. Co.)
3775 N. Holton Street, Dept. M-1231, Milwaukee, Wisconsin

DELTA SPECIALTY COMPANY
(Division of Delta Mfg. Co.)
3775 North Holton Street, Dept. M-1231
Milwaukee, Wisconsin

Please send me, without obligation, 1932 Delta Catalog. Also send full details of your 10-Day Trial Offer and Easy Payment Plans.

Name _____

Address _____

City _____ *State* _____

Classified Advertisements

MONEY-MAKING OPPORTUNITIES IN TABLOID FORM

Rates for classified ads, 15 cents per word per insertion, or 12 cents per word per insertion for six insertions. Minimum 10 words. Cash should accompany order. Closing date 20th of third month preceding date of issue. Address Classified Manager, Modern Mechanics and Inventions Magazine, 35 East Wacker Drive, Chicago, Ill.

AVIATION

SB PROPELLERS are now carried in stock for immediate shipment, in sizes most in demand. Special propellers made up in ten to twelve days. Get our catalog by sending ten cents in stamps to Sensenich Bros., Lititz, Pa.

NEW production sport planes welded steel construction $595.00 with Johnson conversion. Information ten cents. Hibbs, Ft. Worth, Texas.

THE SB HENDERSON Aircraft motor cost only $225.00 complete with hub, New Airscoop, and New portplugs. SB conversion group attached to your Henderson or Indian Four $35.00 each Send ten cents in stamps for catalog. Sensenich Bros., Lititz, Pa.

METAL Tipped Henderson Propellers $9.95; Fords $12.50. Hibbs, Ft. Worth

BE SURE that the motor you purchase for your light plane will fly it. Heath B-4 and Heath Henderson motors are guaranteed to fly and 7 years of constant performance prove it. For economy and reliability these motors cannot be equaled. Send 15c for large illustrated booklet. Heath Aircraft Corp., Dept. KM 12 Niles, Michigan

SPORTPLANES $150 Engines $25 New 80hp $30 Propellers $5 Balloons. Power Gliders Altimeters, Instruments $5 Hubs, Seats $1. Etc. Send 50c for Purchasers Manual Aerobuilders Service, 1315 So. 12th, Lincoln, Nebraska

MODEL airplane kits—supplies, tools, everything' Best and cheapest. Quick service Large illustrated catalog only 10c. Advanced Model Airplane, Peru, Ind

BUILD Corben Baby Ace, complete kits including factory welded fuselage, tail unit, under carriage. Folder, dime. Corben Sportplane Co., Peru, Indiana.

24" FLYING Scale model airplane kits of the "U. S. Army Hawk," the "U. S Marine Corps Falcon" or "Navy Corsair", designed for contest competition Postpaid $1.00 each Empire State Flying Service, 1191 Harrod Ave., New York.

WORLD'S greatest bargains in used airplanes. $160 and up. Folder 10c. Federal Equipment Co., Pewaukee, Wis

$3.00 Glider Flying course for 98c. Five books in all. Karl Ort, Poplar St., York, Pa

AVIATION Manual illustrated with complete engine, glider and airplane drawings including the famous Texaco 13. Send $1.00. John Rettig, 86-22 Dongon Ave., Elmhurst, N. Y

SMALL motors, hubs, propellers for snowsleds, iceboats and lightplanes, cheap. Build now and be ready for iceboat weather. Circulars 10c. Storms Aviation Co., Spartanburg, S. C.

AGENTS

BIG Money selling shirts, ties, underwear, sox, raincoats, lumberjacks, sweaters, leathercoats, overalls, pants, playsuits. Outfit Free! Nimrod Co., Dept 132, 4922-28 Lincoln Ave., Chicago.

AGENTS WANTED

NEW INVENTIONS—Makes any clock electric. Easily attached. Big profits. Bestever Clock Co., 4315-A Irving Park, Chicago.

BIG MONEY and Fast Sales. Every owner buys Gold Initials for his auto. You charge $1.50; make $1.45. Ten orders daily easy. Write for particulars and free sample. American Monogram Company, Dept. 11, East Orange, N. J

GO INTO business—sell new and used clothing. 100% to 300% profit. Satisfaction guaranteed. We start you. Chicago Bargain Clothing, K-121 E 51st, Chicago.

FREE BOOKLET describes 67 plans for making $20—$100 weekly in home or office. Business of your own. Elite Co., 84-G Elizabeth St., New York.

AGENTS' Gold Sign Letters for store windows. 500% profit. Free sample Metallic Letter Co., 426 N. Clark, Chicago.

CALIFORNIA Perfumed Beads, selling like Hot Cakes. Agents coining money. Catalog free. Mission Factory K. 2328W Pico, Los Angeles, Calif

AUTO Mitten Dusters, season's biggest Selling Hit. Over 200% Profit, Free sample offer. National Fibre Broom Co., St. Louis, Mo.

BIG Money Applying Gold Initials on Automobiles. Easiest thing today. No experience needed. $1.45 profit every $1.50 job. Free Samples. "Ralco", B 1045 Washington, Boston, Mass.

MANUFACTURER wants distributor for new "Pocket Radio", only $3.85. "Sells itself with music". Pays 100% profit. Spencer Radio, Dept 23, Akron, Ohio

YOU are wanted to resilver mirrors at home. Profitable business plating auto-parts, tableware, etc. Write Sprinkle, Plater, 850, Marion, Indiana.

300% PROFIT selling new 20 in 1 Kitchen Utensil. Retails 25c Costs you $1.00 doz. Sample 15c. Square Deal Mfg. Co., Desk M-2, Bradford, Pa.

300% PROFIT selling Mystery Gas Lighter. Retails 25c. Costs $1.00 doz. $9.00 gross. Sample 5c. Square Deal Mfg. Co., Desk MM-6, Bradford, Pa.

GUARANTEED hosiery—lowest mill prices. Men's latest fancy hose, dozen, $1.35-$2.00; ladies' fashioned hosiery dozen, $2.25-$3.50. Catalogue free. Superior Knitting Company, Dept. 54, New Haven, Conn.

SUCCEED With Your Own Products. Make—sell them yourself. Formulas, Processes, Trade-Secrets. Expert analytical service. Catalog free. A. Thaxly Co., Washington, D. C.

AUTO ACCESSORIES

A SCIENTIFIC product every automobile owner should have. Guarantees a clean and efficient cooling system at all times. Season opportune. Retails $1.00. Agents wanted. Good commission. Seric Products Co., 2021-A VanBuren St., Chicago.

AUTOMOBILES

CAR OWNERS: Save big money by doing your own repair work. Simple as A. B. C. when you have My Automobile, new 387-page, 227-diagram "how-book" just written by famous automotive engineer. No matter what make or model your car is, this book will tell you how to locate troubles, and exactly what to do to keep your car in A-1 condition every minute of the time Will repay its cost every month in the year and add Fifty Percent to the life of your car Price, postpaid only $3.50. Send your order today to Modern Mechanics and Inventions, 529 South Seventh Street, Minneapolis, Minn.

ADVERTISING

ADVERTISING—24 words 8 big city Sunday papers—$10. One inch display, 50 country weeklies—$5. Copy prepared Free list, magazines, farm. R LeGrand Agency, 34 West 33rd St., New York

BOATS

BUILD Your Own Boat and save two-thirds the builder's cost, using our knock-down ready-cut semi-assembled materials. Cruisers, runabouts, sale, row and outboard cruisers, runabouts and speedsters. 38 designs. Send 10c for 64 page catalog. Brooks Boat Co., Inc., Box M33, Saginaw West Side, Mich.

BOOKS

KNOW YOUR CAR. Avoid breakdowns, save big money on repairs, prevent delays, make your car last longer by using the simple, complete, practical, authoritative rules to efficient car operation and maintenance in new 387-page, 227-chart guide book, My Automobile, by Harold F. Blanchard, famous automotive engineer. Covers every make of car and every car problem. Sent postpaid for $3.50. Send your order today to Modern Mechanics and Inventions, 529 South Seventh Street, Minneapolis, Minnesota

BUSINESS OPPORTUNITIES

COMPLETE Chemical Service. Analysis, Formulas, Consultations. State Licensed Chemist. Twenty-five years' experience. Write for literature. W. L. Cummings, Ph.D., 428 Gordon Avenue, Syracuse, N. Y.

START home business, making artificial marble, colorful glazed tiles, novelties, tabletops, floors, garden furniture, interesting secret methods. Surprising samples 2c. John H. Payn, 945 Grande Vista Drive, Los Angeles, Calif.

SUCCEED With Your Own Products. Make—sell them yourself. Formulas, Processes, Trade-Secrets. Expert analytical service. Catalog free. A. Thaxly Co., Washington, D. C.

DOLLARS in "Fixit" Service. Particulars. Houlgate, 1305 N. ElMolino, Pasadena, California.

START Home-Made Sausage Business' Big Profits. Permanent Future' Write, Box 1212-D, Detroit, Michigan

TATTOOING outfits supplies, illustrated list free. Wenzo M-965, Putnam, Detroit.

BUSINESS OPPORTUNITIES

AMATEUR cartoonists, earn $25.00 week, spare time, copying cartoons for advertisers. Three-M Syndicate, Argyle, Wis

CHEMICAL EXPERIMENTERS

HANDBOOK for Chemical Experimenters, Hundreds of Experiments, Illustrated, 50c. Booklet of Experiments, 15c. Chemical Catalogue, 5c. General Chemical Company, Reading, Pennsylvania.

CHEMICALS

THE New POPULAR CHEMISTRY contains latest chemical news, chemical poems, formulas, answers to questions, etc. Send 30c for three back issues or $1.00 for one year (nine issues) subscription. Popular Chemistry, Dept. M, Swedesboro, N. J.

DETECTIVES

BE A DETECTIVE. Travel, earn, learn. No experience. Write United Detective System, 1333 Walton St., Chicago.

DETECTIVES Earn Big Money. Excellent opportunity. Experience unnecessary. Particulars free. Write, George Wagner, 2190-V Broadway, N. Y.

DUPLICATING MACHINES

"EXCELLOGRAPH" Portable Rotary Stencil Printing Duplicators $39.00. Equipped. Terms, description, testimonials, printed samples, Free. Pittsburgh Typewriter Supply Co., Dept. 840 Pittsburgh, Pa.

EDUCATIONAL BARGAINS

CORRESPONDENCE Courses—Sold, Bought, Exchanged, Rented. Bargain Catalogue Free. Hanfling, W-799 Broadway, New York.

FOR INVENTORS

FOR INVENTOR'S Universal Educator: contains 900 mechanical movements, 50 Perpetual Motions; instruction on procuring and selling patents and selecting an attorney, etc. Suggests new ideas. Price $1.00 postpaid in U.S.A. Address Dieterich Co., 602A, Ouray Building, Washington, D. C

INVENTIONS Commercialized. Patented or unpatented. Write, Adam Fisher Mfg. Co., 582 Enright, St. Louis, Missouri

INVENTORS—Sell your inventions before patenting. Free particulars. Write W. T. Greene, 942 Barrister Bldg., Washington, D. C

I SELL patents. A Service for the inventor. Established in 1900. Experienced, respected. Why take chances? Charles A. Scott, 773MM Garson Ave., Rochester, N. Y.

INVENTORS—Protect your inventions before patenting. Let interested manufacturer pay patent attorney fees. Our system saves time and expense. Write Inventors Advisory Society, Room 1207, 173 W. Madison St., Chicago, Illinois.

FOR SALE

ONE 9" x 24" Shephard screw cutting lathe, complete with chuck, steady rest, compound head and tools, just the lathe for the small shop. Price $45.00. Sensenich Brothers, Lititz, Penna.

FAMOUS MOTORS For Sale: $1500 Bristol Cherub engine, 2 cyl., 32 h.p., formerly used in Heath Baby Bullet, winner of 1928 and 1929 National Air Races. Perfect condition, $450. $1800 Heath 4-70 engine, 4 cyl., 70 h. p., formerly used in Heath Cannonball which took first place at National Air Races, 1930 and 1931. Perfect condition, $600. Also Dayton-four, 4 cyl., 55 h. p., brand new, has never been out of original crate, $325. Heath Baby Bullet race plane, less motor, $800. Heath Cannonball race plane, less motor, $900. Heath Aircraft Corporation, Dept. SM-12, Niles, Michigan.

FORMULAS

STOP Alcohol habit formula 50c. Formulas. 1652 So. Allport, Chicago, Ill.

SUCCEED With Your Own Products. Make—sell them yourself. Formulas, Processes, Trade-Secrets. Expert analytical service. Catalog free. A. Thaxly Co., Washington, D. C.

FORMULAS. All kinds. Catalog free. Clover Laboratories, 178M Park Ridge, Illinois.

GLIDERS FOR SALE

PRIMARY Glider, Shockcord, Towrope $150. William Bennett, Hillsboro, New Hampshire

HELP WANTED—MALE INSTRUCTION

DETECTIVES. Work home or travel. Experience unnecessary. Write, American Detective System, 2188 Broadway, New York.

ICE BOAT

BUILD Speedy Ice Sled using Harley or Indian twin, blue prints $2.00, hubs for Harley or Indian $6.00 each. 4 ft. propellers for twins $8.00 ea. Sensenich Bros., Lititz, Pa.

INVENTIONS WANTED

INVENTIONS Patented or unpatented. Bought outright; manufactured on royalty or commercialized. Urbano Manufacturing Co., 561 Howard Street, San Francisco, California.

MUSICAL

PLAY Piano by Ear. A sound system. Booklet free. Boucher's Harmony studio, Box 12, Ottawa, Can.

MOTORCYCLES

SEND 15c for illustrated used Motorcycle catalog. Large stock. Bargains Indian parts. Accessories. Indian Motorcycle Sales, Kansas City, Mo.

MODELS

INVENTORS: Send us sketch or crude model of your idea. Crescent craftsmen will develop it into a practical working model. 30 years of successful experience and thousands of satisfied clients. Confidential service guaranteed. Bank references furnished. Free illustrated book: "Making Inventions Pay." Crescent Tool Co., Dept. T 12, Cincinnati, Ohio

MAKE money making miniature-model novelties, relief pictures, architectural models. Write for booklet describing six new inexpensive courses for homecrafters and professionals. School of Modelmaking, 1433 N. Normandie, Hollywood, California

MALE HELP WANTED

FORESTRY positions easily available $200 month. Cabin. Hunt, trap, patrol. Get details immediately. Rayson Institute, K 32, Denver, Colo.

MALE, FEMALE—HELP WANTED

WANTED, eligible men, women, 18-50, qualify for steady government positions, salary range, $105-$250 month; paid vacations. Thousands appointed yearly, common education. Write Instruction Bureau, 234, St. Louis, Mo., quickly.

MISCELLANEOUS

LET'S SWAP. Whatcha got? Whatdye want? Dime trial. Swapper Sportsman, Williamsport, Pa

OLD MONEY WANTED

$5 to $500 EACH paid for hundreds of Old Coins. Keep all old money. Many very valuable. Get Posted. Send Ten cents for Illustrated Coin Value Book 4x6. Buying and Selling. Guaranteed prices. Coin Exchange, Room 48, Le Roy, N. Y.

PRINTING

PRINT your own cards, stationery, circulars, advertising, etc. Junior Press $5.90. Job presses $11 up, power $149. Print for others, big profit. Easy rules furnished. Write for free catalog and full information. Kelsey Co., R-57, Meriden, Conn.

PATENTS

INVENTIONS commercialized. Patented or unpatented. Write, Adam Fisher Mfg. Co., 582 Enright, St. Louis, Mo.

RAZORS

24 KT. GOLD Plated Razor, with 10 new Gillette Type Blades 50c. Frank Clyde, 62 Poplar St., Waterbury, Conn.

REAL ESTATE

OZARKS Timbered, river lot, cabin; fishing, hunting, trapping, pearling; boating, $200, $10 monthly. Hubbard, 227 Grossman Bldg., Kansas City, Kan.

SALESMEN WANTED

WANTED County Salesman with car, to demonstrate for large Ohio Manufacturer. First class job. Fyr-Fyter Co., 2210 Fyr-Fyter Building, Dayton, Ohio.

SALESMEN—at last! New feature sells punchboards everywhere. Dealers wild with joy—prosperity back again—profits enormous. Samples free. Puritan Novelty, 1407 Jackson Blvd., Chicago, Ill.

STAMPS

200 DIFFERENT stamps 10c, 60% discount approvals. Ask for United States price list, Seidenberg, Baroda, Mich.

STAMPS! 100 diff. 2c; 500 diff. 35c; 1000 diff. 90c. Tatham Stamps, D9, West Springfield, Mass

"FREE Stamp Tongs with approvals" Commemoratives—Airmails. Pictorials. "Dodges—Station A. Pasadena, Calif."

SCHOOLS

LEARN the Jewelry business. Watchwork, Jewelry and Engraving. Send for free catalogue. Bradley Watchmaking School, Dept. M, Peoria, Ill.

SONG WRITERS

SONGWRITERS — Read "Song Requirements of Talking Pictures, Radio, and Records" an explanatory instructive book SENT FREE to aspiring writers of words for songs. We compose, arrange music and secure copyrights. Write today. E. C. Newcomer Associates, 1674 Broadway, New York.

COMPOSERS—Verse or Music. Brilliant opportunity. Write VanBuren, 2534 McClurg Bldg., Chicago.

SONGWRITERS—"Real" proposition. Hibbeler, D195X, 2104 Keystone, Chicago

SIGNS

SIGN Salesmen, let us tell you about a New Changeable sign, that sells for $1.50 and gives you 400% profit. National Sign System, St. Louis, Mo.

TELEGRAPHY

LEARN Wireless (Radio) and Morse Telegraphy. School, oldest, largest; endorsed by telegraph, radio and government officials. Expenses low—can earn part. Catalog free. Dodge's Institute, Clark Street, Valparaiso, Ind.

Genuine
UNDERWOOD
Below ½ Mfg's. Original PRICE
(Reg. $102.50)

Famous Model No. 5
NOW ONLY $1 DOWN

Think of it—over 2 million buyers paid $102.50 (cash) for this model No. 5 now offered direct to you at way below ½ original price and on easiest terms besides. Positively the greatest bargain ever offered. Accept the special 10-day trial offer and be convinced. See the neat, perfect work it does—compare its bright, shiny newness without risk. Recognized as the *finest, strongest* typewriter built.

Easy Terms—only 10c a day

Here is positively the chance of a lifetime to own a World-famous Standard Underwood No. 5 completely refinished like new at the very lowest price and easiest terms. All complete with modern improvements including standard 4-row keyboard, back spacer, automatic ribbon reverse, shift lock, 2-color ribbon, etc. Ideal for business and professional men—teachers, students, story writers, etc. Don't let this chance pass by.

Learn Touch Typewriting

Learn touch typewriting free! Complete (home study) course of famous Van Sant System given with this offer. Fully illustrated—easily learned

10 Day Trial

You save over $60 by quick action. These genuine guaranteed Underwoods now only $39.50 (cash) while limited supply lasts. Only $1 down brings the Underwood for 10 days' trial. If you keep it—only 10c a day soon pays for your Underwood on our new low price and easiest terms. Send at once before this special offer is withdrawn. Remember every machine fully guaranteed and sent on 10 day trial.

International Typewriter Exch.
231 W. Monroe St., Chicago, Dept. 1205

I enclose $1 deposit. Send Underwood No. 5 (F.O.B. Chicago) at once for 10 days' trial. If I am not perfectly satisfied I can return it express collect and get my deposit back. If I keep it I will pay $3 a month until I have paid $44.50 (term price) in full.

Name .....Age .....
Address .....
Town .....State .....

ANDY'S SHOP MAIL BOX

(Continued from page 24)

Army planes failed to find the ship the first day, and on the second day found it but failed to sink it. The Coast Guard was called out and finished the job with a broadside of 100-lb. shells.

Suppose that had been an enemy battle fleet instead of a defenseless and obsolete freighter. That demonstration, to me, carried more weight than a couple of libraries full of academic arguments.

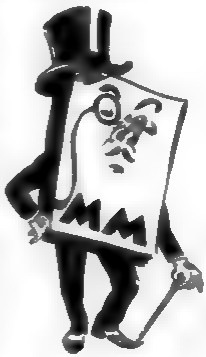
Medals and Monkey-Wrenches

I SURE started something when I ran G. L. Farrar's letter in this column a couple of months ago. I've also found out something which I have surmised to be true all along—Some fellows like the way the editors put out Double M and some don't, but buy it just the same. Just to let you know what the gang thinks, I'll show you a few letters.

Scranton, Pa.

Gentlemen:

I see by the paper (MM) that you take offense at G. L. Farrar's opinion of your "magazine". If you ask me, I think you go around with your nose stuck too high in the air to give a thought to some of us poor readers.



Mr. Farrar knew what he was talking about when he brought out the difference between a mechanical and a sportsmen's magazine. You stand guilty as charged. Why don't you stick to the name of your magazine?

I saw in a few issues back where you were wrought up about Germany's "Big Bertha" and "Crashing Planes for the Movies". I wonder how many readers were excited by these articles, all a waste of space.

I am an optimist, or I wouldn't spend 25c a month on M.M. I always imagine the next issue will be better, but what a disappointment. You started out fine, but you are now branching outside your field.

Give us more "How-to-Builds"—models, furniture, toys, workshop appliances, etc.

I think you are overdoing the light plane idea. Don't think I'm against them. I'm interested in planes and have been up more than once, but I think you should pick the best light plane of the year and publish it,

(Continued on page 36)

RAISE YOUR PAY with HENLEY BOOKS

Henley's books are used in more than 200 Schools and Colleges

AVIATION

☐ Aviation Engine Examiner

By Major Victor W Pagé Aviation engines explained in simple questions and answers. Prepares you for job as aircraft engine mechanic; valuable to pilots and students. Describes all types aviation engines, parts and construction, principles of operation, with instructions for engine inspection, installation, trouble shooting, overhauling and repair. Compact, condensed, simplified 400 pages, 250 illustrations. Price, $3.00.

☐ A. B. C. of Gliding and Sailflying

A brand new book on motorless flying Explains everything about this popular sport; all types of Gliders and Sailplanes, construction, control and launching; principles of gliding soaring, air currents, etc. Instructions for building simple Glider, with WORKING DRAWINGS How to form a Glider Club, etc 200 pages, 70 illustrations Price, Paper Binding, $1.50; Cloth, $2.00.

☐ Modern Aircraft

By Major Victor W. Pagé. Covers all types of American and foreign airships, airplanes, and engines, design and construction, with complete instructions for operation and maintenance. Nineteen practical chapters. Used in 200 schools 855 pages, 400 illustrations, 23 tables Price $5.00.

☐ Modern Aviation Engines

By Major Victor W. Pagé. Most complete treatise on all types of aircraft motors ever published. Describes, explains, illustrates **every type of aircraft motor**—installation repairs maintenance Two great volumes, 1000 pages 500 illustrations in each. Vol I covers principles of aviation engines engine parts and functions, construction, trouble shooting, etc. Vol. 2 gives detailed descriptions of all leading makes of airplane and airship engines of today

Price per volume, $5.00; both volumes, $9.00.

☐ Aerial Navigation and Meteorology

By Captain Lewis A. Yancey Tells how to fly course with precision and assurance 350 pages, 102 illustrations and colored plates Solved problems and examples for practice Price $4.00.

☐ Everybody's Aviation Guide

By Major Victor W. Pagé 600 Questions and Answers that teach aviation from the beginning Complete information necessary for U S. Government license. Construction of airplanes—parts—functions—equilibrium—control, etc 256 pages, 140 illustrations Price $2.00.

☐ A. B. C. of Aviation

By Major Victor W Pagé. A clearly written book giving you a basic knowledge of aircraft and why they fly. An ideal book for everyone approaching study of aviation 160 pages. 150 illustrations. Price $1.

ELECTRICITY

☐ Electricity for Beginners

By E H Thomas. Just the book for those beginning study of Electricity Written by an experienced instructor, and containing 196 pages, fully illustrated. 40 chapters including circuits, resistance pressure horsepower, kilowatt, magneto-generator dynamo, generators and motors, electric light, telegraph, telephone, electro-plating, etc. Used in many high schools Price $1

☐ House Wiring

By Thos. W Poppe, Electric Engineer Revised, enlarged and brought up to date by Harold P. Strand, Master Electrician-Contractor Complete in every detail and in accordance with the 1930 National Electrical Code Profusely illustrated Plans and layout of work in old and new construction —Locating outlets—Sizes of wire—Armored cable wiring—New type ABC Cable—Running the cable—Testing—Meter board construction—Grounding—Bell wiring—Burglar alarm wiring—Telephone wiring—etc. etc 225 pages, 171 illustrations Pocket size. Price $1.00.

☐ Arithmetic of Electricity

By Prof T O'Conor Sloane. Reduces all electrical calculations to a series of simple rules, using only common arithmetic with practical problems and solutions. Does away with need for algebra to understand electrical mathematics Everyone interested in electricity needs this very practical book Revised and enlarged 23rd edition, 230 pages $1.50.

☐ Modern Diesel Engine Practice

By Orville Adams. An indispensable guide for every Owner and Operator, covering every basic fact of Diesel Engine Theory and Operation Combines in one volume a text for study and reference, and a practical manual on operation and repair Written by a recognized authority. Includes the Modern Packard Diesel Aircraft Engine 600 pages, 400 engravings Price $6.00 net. (Special detailed circular sent on request.)

AUTOS

☐ Modern Gasoline Automobile

By Pagé Everything you want to know about automobiles in this NEW EDITION of a famous work Complete, up-to-date, authoritative, clearly and simply written. Care of your car, trouble prevention, trouble detection repairs An encyclopedia in one volume 1146 pages 1000 illustrations Price $5.00. (With special 25x38-inch Trouble Shooting Chart $5.25.)

☐ Ford Model "A" Car, including Model "AA" Truck

By V. W. Pagé New 1931 Revised Edition. Explains the new Ford inside and out, construction operation and repairs 318 engravings Special chapters on the Model AA Truck, new four-speed transmission, bevel drive, and all changes of importance in the new Model A Ford Car 700 pages. Price $2.50. (With special 25x38-inch Ford "A" Trouble Shooting Chart Price $2.75.)

☐ The CHEVROLET SIX CAR and TRUCK

By Victor W Pagé A complete non-technical treatise for owners, operators and repairmen detailing the mechanical features operation, maintenance and repair of the latest model Chevrolet Six Cars and Trucks. 300 pages, 134 illustrations. Price $2.00.

Other New Books

☐ Henley's 20th Century Book of Recipes, Formulas, Processes

The Greatest Book of its kind ever published Contains 10,000 recipes and formulas and everyone should have this book at his command. It is as indispensable as a dictionary Price $4.00

☐ Applied Television

By George H Waltz, Jr., M. E. A practical up-to date manual for amateur and professional Explains theory of Television Broadcasting and Receiving, in simple language Also full directions for constructing home set, with diagrams, charts and photographs Contains glossary of television terms and list of television stations now broadcasting 300 pages, fully illustrated. Price $3.00.

SEND NO MONEY — CHECK BOOKS WANTED

Use this page as your Order Form. Tear out and mail. The books you want will come to you ON APPROVAL. Pay postman on delivery. **Your money back** if not satisfied.

NORMAN W. HENLEY PUB. CO., Dept. MM-1231
2 West 45th Street, New York, N. Y.

Please send me the book checked I enclose no money but will deposit the price plus postage, with postman on delivery. My money back if I return book within 5 days.

Name .....

Address .....

Town ..... State.....
(Outside of U S. cash with order)

☐ **FREE CATALOG** If you don't find the book you want on this page, send for FREE Catalog of famous Henley books. More than 100 different subjects Radio, Machine Shop Practice, Heating, Plumbing, Boats, Chemistry, Railroading, etc.

LUMINOUS PAINT

Make Your Watches, Clocks, Etc., Visible by Night The very latest discovery in the mountable world. Hitherto practically unobtainable except at an exorbitant price, we have at last succeeded in producing this remarkable LUMINOUS PAINT which applied to the surface of any article emits rays of white light, rendering it perfectly visible in the dark. THE DARKER THE NIGHT, THE MORE BRILLIANT IT SHINES. Quite simple to use. Anyone—you can do it. A little applied to the dial of your watch or clock will enable you to tell the time by night. Can also be used to outline or sketch plates of your electric lights, mail boxes, and innumerable other articles make your own! Ammo Cartridge, Luminous Rosaries etc. Small bottle, price 25c. Large size 50c. 1 oz. $1 postpaid. JOHNSON SMITH & CO. Dept. 967 RACINE, WIS.

CIGARETTE MAKER

Roll your own and save money. Easier and quicker, gives more than half. Use your favorite brand of tobacco. No. Neat, useful, handy. Pocket size, weighs ½ oz. Made entirely of metal, nickel plated. 25c, 3 for 65c.

GOOD LUCK RING

Very striking, quaint and unusual. Three fish heads and swastika design two brilliant, flashing gems imported direct from the Orient. Solid sterling silver. Looks like a good deal more. Only 25c postpaid.

Exploding Cigarettes

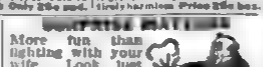
Box contains ten genuine cigarettes of excellent quality. They appear so real, but when each cigarette is about one-third smoked, the victim gets a very great surprise as it goes off with a loud BANG! A great joke to play on your friends. Perfectly harmless. Price 25c box.

NOVELTY BADGES

Wedding Present for Father of the Bride

Garter Inspector for Bachelor Party

Two very novel metal backed nickel plated, that will prove a big hit out of all proportion to their trifling cost 10c, each badge, 3 for 25c, or 75c per doz. postpaid anywhere.

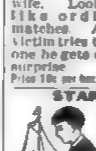


SURPRISE MATCHES

More fun than fighting with your wife. Look just like ordinary matches. As the victim tries to light one he gets quite a surprise. Price 10c per box, 3 boxes for 25c, 12 for 75 cents.

MIDGET BIBLE

GREAT CHRISTMAS Booklet Bible in the World. Size of a postage stamp. 1000 Pages. Held to bring good luck to the owner. A genuine work of art. Must be seen to be appreciated. Make good money selling them! Friends, neighbors, acquaintances, etc. PRICE 15c each, 3 for 40c, 12 for $1.25, 100 for $7.50. Also obtainable in Leather Binding with gold edges. Price 50c each, 3 for $1.25, $4.50 per doz. Magnifying Glass for use with Midget Bible 15c



STAR TOY MAKER

Greatest boys' book ever written. Tells how to make a Pinhole Camera, Game of model Railroad, a Telephone, Boom rang, Telegraph Instrument, Hot Kite, Talking Machine, Microscope, Electric Motor, Electric Door Bell, Water Wheel, Paddle Raft, a pair of Skis, a Dog Sled, Bird House, Rabbit Yard, etc. 64 pages. 150 illustrations. PRICE 10c.

BOY'S OWN TOYMAKER. A new book telling how to make electrical toys, electric toys, mechanical toys, parlor toys, Boards, tricks, etc. 200 pages. Price 25c postpaid.

AMATEUR ELECTRICIAN. all about electricity in simple language. How to make batteries, dynamos, motors, telephones, bells, electric call engines, light, etc. Price 10c postpaid.

MONEY MAKING SECRETS. Golden opportunities for men and women. Big profits. Book, packed full of money-making ideas, recipes, formulas, which are trade secrets etc. Business, mail order, etc. Only 10c postpaid.

ROPE SPLICING, how to make different kinds of splices. 32 pages. 100 illustrations. 25c postpaid.

CARD TRICKS and sleight of hand. Here are all the latest and best card tricks as performed by celebrated magicians with explanations of card tricks used by professional magicians. Price 25c postpaid.

MAGIC FOR AMATEUR MAGICIAN. Containing 48 tricks, some of experiments in magic, with illustrations. Price 25c postpaid.

HELLER'S BOOK OF MAGIC. Magic and how to do it. Complete parlor tricks explained and illustrated. 200 pages. 250.

TRICKS IN SOCIAL ENTERTAINMENT. Contains hundreds of ample tricks, illusions, etc., that anyone can do. Also explains secret of performed tricks. Price 25c postpaid.

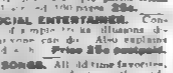
33 OLD TIME SONGS. All old time favorites, as originally published. Words and full music. Price 25c postpaid.

WONDERFUL X-RAY TUBE

10c

A wonderful little instrument producing optical illusions both surprising and startling. With it you can see what is apparently the bones of your fingers, the wood in a lead pencil, the interior opening in a lump of sugar, and many other similar things. Price 10c, 3 for 25c.

SERPENT'S EGGS



Box contains 12 eggs. When lit with a match each one gradually hatches itself into a snake several feet long, which curls and twists in about in a most lifelike manner. Price per box, 10c postpaid 3 for 25c

MUSE FLUTE

The Magic Nose Flute, or Harmatone, is a unique and novel musical instrument that is played with nose and mouth combined. There is just a little knack to playing it which when once acquired will enable you to produce very sweet music that somewhat resembles a flute. There is no fingering and once you have mastered it you can play all kinds of music with facility and ease. Can be played as an accompaniment to a piano, or any other musical instrument. The effect is so charming as it is surprising.

Post Paid **10c**

BLANK CARTRIDGE PISTOL

Protection against Burglars, Thieves, & Dogs

Special offer 1 Blank Cartridge Pistol 100 Blank Cartridges 1 650 page Novelty Catalog **ONLY $1.50** The Lot shipped by Express Only Cash with Order Only

Well made and effective, modelled on latest type of Revolver; appearance alone is enough to scare a burglar. When loaded it may be as effective as a real revolver without danger to life. It takes standard 22 Cal. Blank Cartridge – obtainable everywhere. Special Cash with order offer! Superior quality Blank Cartridge Pistol 100 Blank Cartridges and our new 650 page De Luxe Catalog of latest novelties, all for ONLY $1.50. Shipped by Express only. Cannot go by parcel post. Extra Blank Cartridges 50c per 100. special shooter (Cowboy type) for pistol $4.00. No C.O.D. shipments.

Combination Thrift Vault and Savings Bank $1.50

HAS REAL THREE NUMBER COMBINATION LOCK KEYLESS—CANNOT BE PICKED

Your money and valuables will be perfectly safe in this new Combination Thrift Vault and Savings Bank because it has a real combination lock just like the regular Safes and Vaults. The lock requires three numbers to open it. There are 64 000 different combinations. The lock is pick-proof. It cannot be opened by slamming. As the combination knob on it operates silently like the lock on a safe or vault. It is perfect in every piece of the work. No key is required. Once you learn the combination it can be opened in a moment or two. It takes coins of any size, currency, etc., or you can use it for storing jewelry and other valuable articles, and it keeps your private memorandums, etc. from prying eyes. And currency can be placed in the bank through the slot at the top but the larger articles will necessitate opening the bank by means of the combination. PRICE with secret instructions for opening $1.50 post.

LOOK 35¢ LOOK

Wonderful Instrument. Greatest thing yet. Nine separate articles in one. Everybody delighted with it. Odd, Curious and interesting. Lots of pleasure as well as very useful. It is a double Microscope for examining the wonders of nature. It has an Opera Glass a Stereoscope, a Burning Lens, a Reading Glass, a Telescope, a Compass, a pocket Mirror, and a Laryngoscope—for examining eye, ear, nose and throat. It is worth all the cost to locate even one painful cinder in the eye. Folds flat and fits the pocket. Something great—you must see it. Don't miss it. Sent by mail. Only 35c or 3 for $1.00.

PISTOL CIGARETTE CASE

It looks like a deadly weapon, but it is merely a novel Cigarette Case. This clever contrivance has proved itself better than the real thing in many an awkward encounter. Great fun sticking up" young friends. They squirm and protest it might be loaded. Pull the trigger and the slide flies open disclosing the cigarettes. Well made, light and compact. Weighs only 2 ounces.

Shock of cold water and blank cartridge in the PUN belong every time. Blank cartridges 50c per 100.

PRICE POSTPAID 25c

GYROSCOPE TOP

Spins in any position. Defies law of gravitation.

The Gyroscope Top is a popular scientific toy that defies the law of gravitation. The illustration as above shows a very few of the many of amusing things it can be thrown and caught running rapidly all the time. It will travel along a taut string or wire. You can suspend it from a loop of string at it spinning vigorously. It will spin on the point of a pin and will revolve in a dozen different ways on the pin point. An effective feature can be performed by spinning the top at a high speed and quickly placing it in the square cardboard packing box. Put on the lid and then set the box on one of its corners. The box will soon drop down flat on its side presenting a very curious appearance. It is a most instructive novelty always interesting for the many amusing experiments which scientists find hard to explain. As a scientific instrument it is used to demonstrate the principle of rotation, attraction and equilibrium of bodies in motion the center of gravity and centrifugal force. Placed on the pedestal it illustrates the rotation of the globe better than any other mechanical device. Gyroscopes are used to steer torpedoes, steady ships, to balance monorail trains, and in aerial navigation. PRICE 25c postpaid.

JOHNSON SMITH & CO. Dept. 967 RACINE, WIS.

JOHNSON SMITH & CO.

Dept. 967 RACINE, WIS.

A De Luxe Edition of our new CATALOG mailed on receipt of 25c. Handsomer than ever. Bigger and better than ever. Only book of its kind in existence. Nearly 600 pages of all the latest tricks in magic, the newest novelties, curios, games, sporting goods, rubber stamps, unusual and interesting books, curiosities in seeds and plants, and many other attractions. Sent by Cash, Money Order, Check or Unused U. S., Canadian and Foreign Stamps for all articles listed above. See next page also

BOYS! BOYS! BOYS!

THROW YOUR VOICE

The Ventrilo

Into a trunk, under the bed, under a table, back of the door, into a desk at school, or anywhere. You get lots of fun fooling the teacher, policemen, peddlers, and surprise and fool all your friends besides.

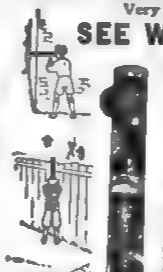
is a little instrument that fits in the mouth out of sight. Cannot be detected. It is used in connection with the above, and with the aid of this wonderful DOUBLE THROAT, or VENTRILO, you can imitate many kinds of birds, animals, etc. Remember you get everything for ONLY TEN CENTS—a booklet giving you full instructions how to become a ventriloquist and throw your voice, the Double Throat, or Ventrilo, and our big catalog of novelties, tricks, puzzles, masks, books, etc

All Sent Postpaid to Any Address for Only 10c

THE DANDY PERISCOPE

Very Interesting and Amusing Novelty

SEE WITHOUT BEING SEEN



Look Over the Heads of the Tallest Men in a Crowd.

See Over a Fence, Around Corners, Etc.

LOTS OF FUN AND AMUSEMENT

Strongly Made. Equipped with Mirrors, Sight-Finder and Eye-Piece.

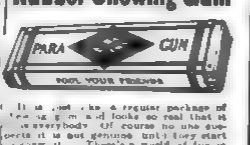
THIS is the same kind of instrument that the soldiers use in the trenches to watch the enemy without risk of being seen themselves, and every submarine has one to project above the surface of the sea to keep a look-out for other vessels, etc With it you can gaze over a high wall or see around a corner without being seen yourself, or if you are in a crowd, you can look right over the heads of the tallest men and watch all the fun Our illustration will give you some idea as to the numerous uses to which the Periscope can be put Every Boy Scout should have one for signaling and anyone can use it for some rare amusement The Dandy Periscope is very strongly made will stand the roughest handling and the hardest wear and is a handsomely lacquered instrument. It measures 17 inches long and 2 inches over two inches wide The Periscope Tube is handsomely decorated with [illegible] designs to show many of its uses, and each Periscope comes complete in box.

Price Postpaid to any Address. $1.00

INVISIBLE INK

The most confidential messages can be written with this ink, further writing makes no mark. Cannot be seen unless you know the secret. Invaluable for many reasons. Keep your pressman and other private memorandums away from prying eyes. Great fun for playing practical jokes. Only 10c a Bottle; 3 for 25c; 12 for 75c postpaid.

Rubber Chewing Gum



It is just like a regular package of chewing gum and looks so real that it never body of course but when suspects it is not genuine until they start to chew it There's a world of fun in this rubber chewing gum—5 sticks to the package. Price, 10c Pkg.; 3 for 25c; 12 for 75c postpaid.

Rubber Tacks	Box 10c	Rubber Cigarettes	Price per Box 20c
Rubber Cigars	Price Ea. 10c	Rubber Matches	Price per Pkg 10c

MAGICIAN'S BOX OF TRICKS

Apparatus and Directions for a Number of Mysterious Tricks, Enough for an Entire Evening's Entertainment..... $1.00

ANYONE CAN DO THEM

It is great fun mystifying your friends. Get this Conjurer's Cabinet and you will be the observed fellow in your district. It contains the apparatus for ten first-class tricks, including The MAGIC BALL AND VASE TRICK (a wooden ball is placed inside, and upon replacing the lid has disappeared and is found in someone else's pocket. The HINDOO TRICK CARDS (can be made the magic card pretty no less than five times. The PAPER-BALL AND COIN BOX, a coin placed in the wooden box vanishes entirely or changes into a coin of another denomination). The GLASS GOBLET TRICK, a coin dropped into a glass of water and when the water is poured out the coin has vanished and is found somewhere else. The RIBBON FACTORY FROM THE MOUTH TRICK (a seemingly endless supply of colored paper ribbons coming out of your mouth). The DISAPPEARING HANDKERCHIEF (a handkerchief held in the hand mysteriously vanishes), the WIZARD'S RISING COIN TRICK, the [illegible] CHINESE [illegible] (a [illegible] moment is able to make it lay down), the GREAT HAT AND DICE TRICK (a large dice is placed on top of a hat, dumpspace, and is found underneath yet no one has touched the hat) and last but not least, the GREAT PHANTOM CARD TRICK, or two from five leaves nothing. Full instructions are sent for performing each trick In addition to the above a number of other tests and stunts are fully explained for which you can easily make or procure the necessary apparatus. Price complete $1.00 [illegible] SMITH & CO.

U. S. BABY TANK

25 Cents

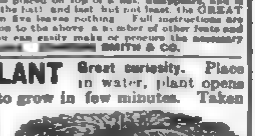
It goes with real Yankee Pep—by its own power

Most remarkable toy ever invented. Tank backward, either with the hand or over the floor or table and back. Then plug it on, it will crawl along, overcoming all obstacles. In the same lifelike manner as the larger tank that proved so deadly in the great war. What makes it go is somewhat of a mystery for there is no mechanism to wind up as is usually understood with mechanical toys, yet this tank will keep [illegible] for [illegible] times longer than the ordinary run of toys. It will perform the [illegible] in a [illegible] manner, and is of substantial [illegible] inches long. Price only 25c, prepaid. Stamps accepted

JOHNSON SMITH & CO.

RESURRECTION PLANT

Great curiosity. Place in water, plant opens up and starts to grow in few minutes. Taken out it dries up and goes topsleep until put in water again. PRICE 10c, 3 for 25c. The per dozen, postpaid



$1.50 ROLMONICA

A Mouth Organ that Plays with a Music Roll

Any One Can Play It Without Practice

A Wide Selection of Rolls to Choose From

A Veritable Pocket Size Jazz-Band!

All the latest Broadway Hits

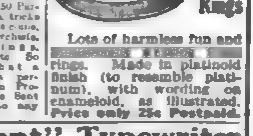
The Pocket Player Piano

Rolmonica is an automatic harmonica that plays a music roll just like a player piano. It is a whole brass band all in one—the biggest musical novelty of the past few years. Anyone can play it, for all you have to do is to insert a roll and turn the handle while you blow That is all there is to it! Nothing could be simpler Any child who can do these two simple things can play the Rolmonica It is a veritable pocket size Jazz-band, combining the principles of the harmonica and the player piano It is an instrument of a thousand melodies, it plays the popular airs of the past, as well as the latest Broadway hits There are two kinds of rolls to select from, such as My Blue Heaven, Home Sweet Home America Old Black Joe Annie Laurie Sidewalks of New York Humoresque, Wild Irish Rose Rosie O'Grady, Among My Souvenirs, Love's Old Sweet Song, Dixie, Mighty Lak a Rose Aloha Oe, Ramona, Juanita, Rose Marie, Onward Christian Soldiers, Sally of My Dreams, Carolina No. 1, Way Down Ole Swanee River, Over There, Ma Cherie, Long Way to Tipperary, Make Believe, Desert Song, La Paloma, Sweet Adaline, I've Got a Feeling Pagan Love Song, When My Dreams Come True, Parade of Wooden Soldiers, Land of Sleepy Water, Turkey in Straw, Hail the Gang's All Here and hundreds of others. An unfailing source of amusement You can delight your friends for hours and play tune after tune simply by changing rolls Small in size fitting your pocket yet mighty in its finger-tickling, toe-tingling tune power Not a toy but a genuine musical instrument and the life of any party One Roll free with each Rolmonica. Extra Rolls always obtainable complete list with each instrument New Rolls added each month. PRICE with 1 Roll $1.50; Extra Rolls 10c each, all postpaid.

Send remittance (Postage Stamps accepted) for all articles listed above, also in our other ad on previous page

MAGIC MADE EASY 250 MAGIC TRICKS 10c

An excellent little book containing 250 Parlor Tricks with cards, rope, handkerchiefs, eggs, rings, glasses and so on, so that a child can perform them. Fascinating. Best pocket to any address for only 10c. 3 copies for 25c.



Comical Motto Rings

Lots of harmless fun and [illegible] rings. Made in platinoid finish (to resemble platinum), with wording on enameloid, as illustrated. Price only 25c Postpaid.

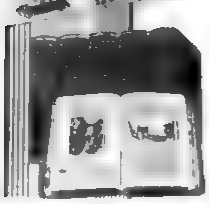
The "Little Giant" Typewriter

A First Class Writing Machine For $1.50

A perfect little typewriter for $1.50. There must be thousands of persons who would like to use a typewriter but whose needs and business do not warrant the expense attached to the purchase of a first-class ninety-five dollar machine. To such persons we confidently recommend our Little Giant. It is strongly made, has simple but complete rubber, so that anyone can quickly learn to operate it, and write as rapidly as they would with pen and ink. The keys consist of the alphabet and figures, punctuation marks being together With this machine you can send your best girl a typewritten love letter, address envelopes, make out bills, and do almost any kind of work not requiring a large expensive machine. With each typewriter we send a tube of ink and full printed instructions for using the machine. Price complete $1.50 by mail postpaid to any address in the world. Stamps accepted.

JOHNSON SMITH & CO. Dept. 367 Racine, Wis.

NOW FIX ANY MAKE OF AUTO



SIX BIG AUTO BOOKS ALL SHIPPED FREE

on approval; whether you want to qualify as garage owner, auto repair expert or merely wish to know how to keep your own car 100% efficient, look at these books—they are sent to you for free examination. This brand new 1931 edition has been prepared by a large group of America's greatest automotive engineers. Anybody who can read will understand them, for this automobile encyclopedia is a veritable gold mine of valuable facts. Take advantage of this opportunity now; send in the coupon for FREE examination. You don't pay us a penny, you don't obligate yourself to pay anything at first, you decide to keep the books. Just tell us you want to see them and the full set of 6 large volumes just off the press will be sent to you. Read them, look them over and prove to your own satisfaction that one fact alone which you will find in them, may save you an expensive repair, or help you to a better job.

Aviation Motors

In addition to being a complete cyclopedia of automobile engineering, these books contain over 100 pages on Aviation Motors and as they are just off the press they bring to you the newest and latest information obtainable. This alone makes these books invaluable to anyone.

New 1931 Edition

Imagine books which are so new that every page is right up to date—wiring diagrams, construction details, service problems—are all right up to the minute. Nowhere else can you get as complete information. Over a million dollars of resources have enabled us to give you the most modern books on the subject ever published. You will find nearly 20 pages on front wheel drives alone. Everybody interested in automobiles in any way will welcome these books, especially on our no money offer.

Can You Fix It?

Can you take out "play" in differential? Can you kill the "shimmy" in steering? Can you reset TIMING? Can you put your finger on engine trouble without guessing or tinkering? Can you pull the starter off and fix it? Can you adjust and repair transmission, engine, rear axle, bearings?

These Books Tell How and they tell how to do any and every auto job right, the first time.

6 Big Volumes

Nearly 3,000 pages, over 2,000 illustrations, wiring diagrams, equipment charts etc. DeLuxe edition with gold-stamped flexible binding. Sent FREE for 10 days' use. If not wanted return express collect. If kept, send only $2 after 10 days, then $2.00 a month until special advertising price, $24.80, is paid.

A Year's Consulting Membership FREE!

Privilege of consulting engineers of million-dollar American Technical Society on any automotive problem for one year without charge, if you mail coupon immediately.

SEND NO MONEY

American Technical Society, Dept. A-9320,
Drexel Ave. at 58th St., Chicago, Illinois.

I would like to see the new 6 volume 1931 edition of your automobile books but without any obligation to buy. I will pay the few cents delivery charges only and will examine the books and return them at your expense in 10 days unless I like them, in which case I will send you $2.00 then and only $2.00 per month until the special price of only $24.80 is paid. You are to include free, consulting membership certificate in the American Technical Society. Send brand new 1931 edition.

Name .....
Street .....
City ..... State .....
Employer's Name .....
Employer's Address .....

These books sent free for examination to anyone sending name and address and that of his employer.

ANDY'S SHOP MAIL BOX

(Continued from page 32)

and not publish a plane every month just because some light plane bugs demand space on their hobby. Some of the more popular planes are built, but are the others worth the money spent on them? (That's a fair question, Gang. Are they?)

I have all my M. M.'s bound and I hate to break the series, but if you don't change I'll be forced to. Less of your feature articles and more "how-to-builds". Let's have it MODERN MECHANICS and INVENTIONS and not hash.

Hoping for the best, (optimist),
S. E. BARROWS.

Do Messrs. Farrar and Barrows represent the majority of Double M readers, or does the following letter express the true feelings of the gang? I wonder!

Santa Monica, Calif.

Dear Andy:

Just a line to tell you to just tell those birds that don't like the stuff in M. M. not to read it. (Aw, you tell 'em, Walt!)

It would be far better if those kind never bought it anyway, for as long as they buy it they're knockers. Anyway, don't cut out any articles. They are all a great advantage to a magazine. That guy wanted the animal stories taken out. I'll bet there are at least 1,000 people buy it just for that, and the same for all the other articles.

That guy was just Scotch (So am I, Walt) and only interested in one thing. There are a lot of things in it I don't read, but I always get my share though.

I say don't change anything. And give us more on wild animals than domesticated ones, for everybody knows all about them.

Yours truly,
WALTER JOHNSON.

The circulation manager doesn't seem so hot about the knockers not buying. He says that two bits is two bits, whether it comes from a knocker or a booster. So that lets your suggestion out, I guess, Walt. Anyway, it would complicate matters if all newsdealers had to ask whether a purchaser of Double M was a knocker or a booster before he would sell a copy. I'm in favor of letting the knockers buy two copies—one for throwing in the fire in disgust, and the other for binding, as Mr. Barrows does. But let's get on with this argument.

Vancouver, B. C.

A. S. M. Box,
Dear Sir:

In the September issue there is a letter from Mr. Farrar. Well, I quite agree with him that M. M. should live up to its name, as

(Continued on page 38)

The WHITE WASP AMAZING MODEL PLANE

Rises off Ground

WE'LL GIVE IT TO YOU GIVEN AWAY!

Made by Kingsbury especially for us Obtainable nowhere else

Here's a high-flying, long-flying plane that's a positive sensation—the new White Wasp. Rises off ground. Will not nose-dive, stall or spin. Soars to high altitude in long, thrilling flights.

Made especially for us by Kingsbury, world's leading maker of model planes. Result of months of experimenting. Positively the slickest, snappiest plane you ever saw and will outperform most planes costing several times as much. Many brand new features which insure supreme performance.

Not a construction set—a ready-to-fly plane. 30 seconds after postman delivers your plane you can send it into the air, banking, zooming, rising over housetops. Look at these action photographs of White Wasp in flight!

Flight Guaranteed

We positively guarantee the White Wasp to fly and to satisfy you in every way. This plane will create a positive sensation everywhere. Every boy in town will envy you. Yet you may have it FREE!

USE SPECIAL COUPON

[illegible] Payson
Open Road for Boys,
130 Newbury St., Boston, Mass.

This offer good only in the United States.

Friend Pilot: You bet I want this sensational plane! Here's my dollar. Put me down for a whole year for OPEN ROAD FOR BOYS MAGAZINE and rush me a White Wasp Plane immediately.

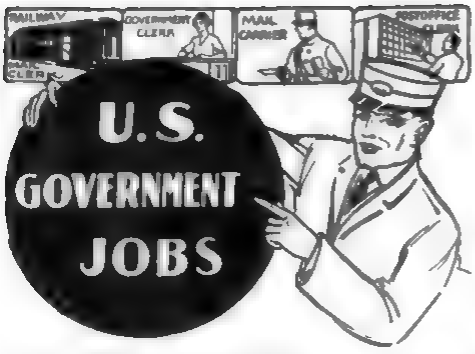
Name .....

Street & Number .....

City or Town....

A GRAND BOY'S MAGAZINE

THE OPEN ROAD FOR BOYS MAGAZINE is a [illegible] magazine brimful of thrilling, [illegible] stories of high adventure [illegible] deep mystery and suspense. Big de[illegible] Contests galore with prizes for [illegible] One whole of a magazine say 200 000 [illegible] Regular subscription price to OPEN ROAD FOR BOYS MAGAZINE alone is $1.00 a year. Fill out and [illegible] the coupon below, with $1.00 and we'll send you THE OPEN ROAD FOR BOYS MAGAZINE for one year and we'll rush a White Wasp Plane to you FREE of all charge. This is a great offer. Send coupon today.



$1260 to $3400 a Year

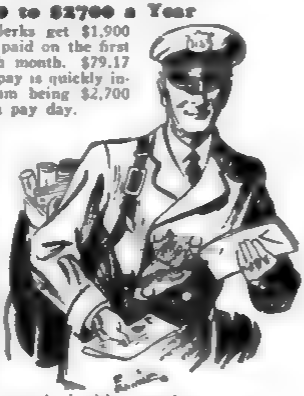
PICK YOUR JOB

Men, Boys—18 to 50

These are steady positions. Strikes, poor business conditions, or politics will not affect them. Government employees get their pay for twelve full months every year.

$1900 to $2700 a Year

Railway Postal Clerks get $1,900 the first year, being paid on the first and fifteenth of each month. $79.17 each pay day. Their pay is quickly increased, the maximum being $2,700 a year. $112.50 each pay day.



Railway Postal Clerks, like all Government employees have a yearly vacation of 15 working days (about 18 days). On runs, they usually work 3 days and have 3 days off duty or in the same proportion. During this off duty and vacation their pay continues just as though they were working. They travel on a pass when on business and see the country. When they grow old, they are retired with a pension.

City Mail Carriers, Post Office Clerks

Clerks and Carriers now commence at $1,700 a year and automatically increase $100 a year to $2,100 and $2,300. They also have 15 days' paid vacation. City residence is unnecessary

Customs and Immigrant Inspector

Salary $2,100 to $3,300. Men 21 to 45. Work connected with examining immigrants and merchandise entering the country from foreign ports.

You Can Get Them

Experience is usually unnecessary and political influence is not permitted. Let us show you how

Get Free List of Positions

Fill out the following coupon. Tear it off and mail it today—now, at once

This investment of two cents for a postage stamp may result in your getting a government job

FRANKLIN INSTITUTE, Dept. J-300, Rochester, N. Y.

Rush to me entirely free of charge (1) a full description of the position checked below, (2) Free Copy of 32-page book, "How to Get a U. S. Government Job"; (3) A list of the U. S. Government Jobs now obtainable; (4) Tell me how to get a Government Job.

- ☐ Railway Postal Clerk ($1,900-$2,700)
- ☐ Post Office Clerk ($1,700-$2,300)
- ☐ City Mail Carrier ($1,700-$2,100)
- ☐ Rural Mail Carrier ($2,100-$3,000)
- ☐ Government Clerk—File Clerk ($1,200-$2,500)
- ☐ Inspector of Customs ($2,100-$3,300)
- ☐ Prohibition Agent ($2,300-$2,600)
- ☐ Immigrant Inspector ($2,100-$3,000)

Name .....

Address .....

Use This Coupon Before You Misplace It

ANDY'S SHOP MAIL BOX

(Continued from page 36)

a mechanic doesn't want to know anything about fish or bird dogs—he wants to know something more about his trade. We used to be able to get it in M. M., but lately you don't seem to have very much time for us grease monkeys, but I hope you do in the future.

A Grease Slinger,

W. P. BOHLE.

P. S. I guess if people didn't write and let you know what they liked best you might be printing love stories.

And from the other side of the fence comes this one:

Corning, N. Y.

Dear Andy:

I bought my first Double M. in November, 1928, and I haven't found a bum one yet. I just got the October issue last night, and the "Flying Bathtub" is a little dandy.

Say, Andy, why don't you tell those guys that are crabbing about M. M. to crawl into a hole and pull it in after them. Guys that find fault do not know what they want. I have every issue of the magazine with the exception of February, 1929, from November, 1928. When did they start printing it? (You started from the first issue, Ray).

It is a good mag because you know how to mix everything together to make it interesting. I have no fault to find with it.

Your friend,

RAYMOND MURRAY.

And now we come to another kick, which concerns makeup rather than contents.

Ridgeway, Pa.

Dear Andy:

I have a complaint to make about your magazine. It's your exasperating habit of continuing your articles to another section of the book. I'm sure there are plenty of other readers of the otherwise perfect magazine that feel the same way about it as I do.

Every time I begin to read an article and become thoroughly interested in the text, along come the words "Continued on page so-and-so". It just burns me up. It seems to me that a high class magazine like Double M would not have to stoop to the practice employed by cheap fiction books to get the readers to look at their ads. Why not put it up to the readers and let them vote on it?

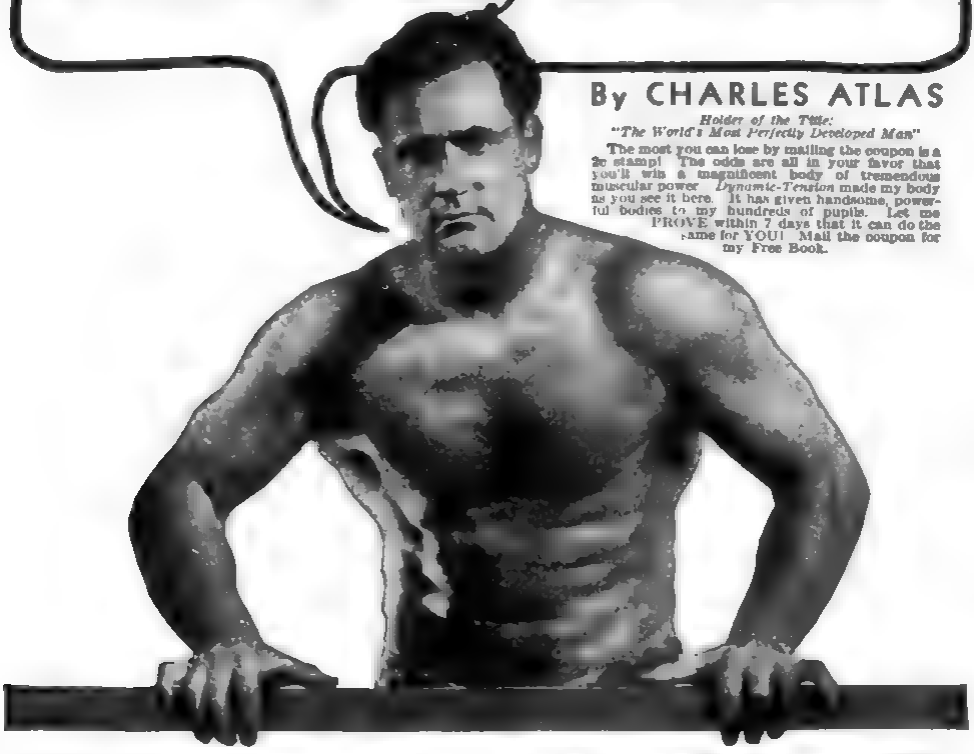
Yours truly,

EARL KITTER, JR.

I fully agree with Earl that breaking the story into the back of the book is sometimes exasperating, but I know the reason for this and so am able to reconcile myself to this minor annoyance. It's this way,

(Continued on page 42)

Would YOU Gamble 2¢ to Win a Body like Mine?



By CHARLES ATLAS

Holder of the Title:
"The World's Most Perfectly Developed Man"

The most you can lose by mailing the coupon is a 2c stamp! The odds are all in your favor that you'll win a magnificent body of tremendous muscular power. *Dynamic-Tension* made my body as you see it here. It has given handsome, powerful bodies to my hundreds of pupils. Let me PROVE within 7 days that it can do the same for YOU! Mail the coupon for my Free Book.

HOW does *your* body stack up against mine? Will you give me a chance to PROVE that my method, *Dynamic-Tension*, will do for you what it has done for me and hundreds of my pupils?

I'm so sure of what *Dynamic-Tension* can do that I can make you an Offer which other Physical Instructors don't DARE to make. I agree to show you definite results *in 7 days*, to give you conclusive PROOF *within a week* that I can transform you, too, into this NEW MAN of mighty energy and strength.

I used to weigh only 97 pounds. I was sick more than half the time. Then I discovered *Dynamic-Tension*. This system changed me from a weakling into the man who was acclaimed in two international contests as "The World's Most Perfectly Developed Man."

My *Dynamic-Tension* method works hand in hand WITH Nature. There's nothing artificial about it, no pills, special foods, rays, or any tricky apparatus that may strain your heart and other vital organs.

"Everlasting Health and Strength"—FREE

Let me tell you all about it in my free book. You can win a body like mine, as my hundreds of pupils have done—by risking only a 2c stamp to mail the coupon for my free book! Fill in the coupon *right now* and send it to me personally. CHARLES ATLAS, Dept. 6-M, 133 East 23rd St., New York City.

CHARLES ATLAS, Dept. 6-M, 133 East 23rd Street, New York City.

I want the proof that your system of Dynamic-Tension will make a New Man of me—give me a healthy, husky body and big muscle development. Send me your free book, "Everlasting Health and Strength."

Name.....
(Please print or write plainly)

Address.....

City.....

State.....

Learn RADIO at COYNE

TELEVISION, TALKING PICTURES

Dissatisfied with your present job? Not making enough money? Then let me show you how to prepare for a real job at a real pay, in RADIO—one of the fastest growing, biggest money-making trades on earth.

Jobs Leading to Big Pay

Scores of jobs are open to the Trained Man—jobs as Designer, Inspector and Tester—as Radio Salesman and in Service and Installation work—as Operator, Mechanic or Manager of a Broadcasting Station—as Wireless Operator on a Ship or Airplane—jobs with Talking [illegible] and Manufacturers of Sound Equipment—with [illegible] and Studios—fascinating jobs, offering unlimited opportunities to the Trained Man.

TEN WEEKS OF PRACTICAL SHOP TRAINING

Come to Coyne in Chicago and prepare for these jobs the QUICK and PRACTICAL way—BY ACTUAL SHOP WORK ON ACTUAL RADIO EQUIPMENT. Some students finish the entire course in 8 weeks. The average time is only 10 weeks. But you can stay as long as you please, at no extra cost to you. No previous experience necessary. Get the facts!

BROADCASTING—TELEVISION SOUND EQUIPMENT

In addition to the most modern Radio equipment, we have installed in our shops a complete model Broadcasting Station, with Sound Proof Studio and modern Transmitter with 1,000 Watt Tubes—the Jenkins Television Transmitter, with dozens of home-type Television receiving sets—and a complete Talking Picture installation for both "sound on film" and "sound on disk." We have spared no expense in our effort to make your training as COMPLETE and PRACTICAL as possible. Mail coupon for full details!

COYNE IS 32 YEARS OLD

Coyne has been training men since 1899. Get all the facts—FREE! [illegible]

MAIL THE COUPON FOR A FREE COPY OF OUR BIG RA[illegible] BOOK.

H. C. LEWIS, President
Radio Division, Coyne Electrical School
500 S. Paulina St., Dept. 61-1H, Chicago, Ill.

Send me your Big Free Radio and Television Book. This does not obligate me in any way.

Name .....

Address .....

City ..... State .....

A NEW STAR

Read the story of

Lil Dagover

the toast of Europe and the latest Hollywood Sensation!

ALSO: A complete novelet of the thrilling gangster film, Scarface; facts about Hollywood's Five Most Dangerous Women; the stars reveal their best friendships in Pals They'll Never Forget. There are many other interesting features. Here is a magazine crammed from cover to cover with the intriguing gossip and personalities of movieland.

Do not fail to read

December

SCREEN BOOK

10c per copy

Now on Sale Everywhere

If your news dealer is sold out, send 10c in stamps or coin to SCREEN BOOK Magazine, 529 South Seventh Street, Minneapolis, Minn, and a copy of the December issue will be mailed directly to you.

Follow the Direct Road to SUCCESS

Do you want a better position and a larger pay envelope? There is just one way to win success—be head and shoulders above your fellows by gaining a broader basic education. Mathematics is the basis of all education. Not a day passes in which you do not have to use mathematics in your work. Do you make your own calculations, or are you handicapped by your inability to do this work yourself? Here is the whole secret of success. This is why mathematics is taught in every school and college.

A thorough knowledge of it makes clear so many things which are puzzling you today.

Do not let another day pass without doing something to improve your knowledge of mathematics. But how can you obtain this knowledge? By going back to school or college, or taking an expensive correspondence course? You need do neither!

At Last! Mathematics Self-Taught This Simple Easy Way!

Now you can take advantage of this easy method which has been worked out by an expert for those who do not wish to give the time and money required by other methods of mathematical study. A very simple and extremely interesting group of books has been prepared for you by a man who has devoted his life to teaching practical men the fundamentals of this important subject.

MATHEMATICS
FOR SELF STUDY

By J. E. Thompson, B.S. in E.E., A.M. Dept. of Mathematics, Pratt Institute, Brooklyn

These books start right from the beginning with a review of arithmetic that gives you all special short-cuts and trick problems that save countless hours of your time and make you more valuable to yourself and your job. Then they go right into higher mathematics and show you how simple it is when an expert explains it for you. Don't let appearances fool you, mathematics is easy. You can get these books on approval and see for yourself how much enjoyment you can have while getting this valuable training and solving interesting practical problems that puzzle your friends and fellow-workers. In no time at all you will be tackling with ease the most difficult question on this subject.

A Complete Reference Work on Mathematics in These Four Inexpensive Books

Starting from the first simple principles, these interesting books take you, by easy stages, into the detailed applications of higher mathematics. Each step is clearly explained and is followed directly by sample problems.

Arithmetic for the Practical Man
Algebra for the Practical Man
Trigonometry for the Practical Man
Calculus for the Practical Man
4 Volumes—1240 Pages—Illustrated

An Expert Gives You These Simplified Methods

Mr. Thompson, the author of these books, is not an ordinary teacher of mathematics. He has had many years' experience in giving students the kind of mathematical training they need in practical work. He presents each practical method and problem in the clearest and simplest way. He gets right down to the kind of information that you need in your daily work. Look up any mathematical problem that puzzles you in these books and see how quickly you get the solution.

Every Minute you Spend with these Books Will pay you Big Dividends

J. T. Madden (Dean, School of Commerce, N.Y.U.) Says "The mastery of mathematics will prove of great practical value in this commercial age as a training in accuracy and logical reasoning."

SEND NO MONEY

Examine These Books for 10 Days FREE!

The coupon below brings you the four books for 10 days' free trial. After 10 days, return the books to us without obligation or send us the small down payment of $1.65—balance in three monthly payments of $2.00 each (5% discount for cash).

MAIL THIS COUPON

D. Van Nostrand Co., Inc.,
250 Fourth Ave., New York

Send me MATHEMATICS FOR SELF STUDY in 4 volumes. Within 10 days I will either return the books or send you $1.65 as first payment and $2.00 per month for 3 months—total $7.65. (5% discount for cash.) (Mod. Mech. 12-31)

Name .....

Address .....

City and State .....

Business Connection .....

Reference .....

You Can Learn HYPNOTISM

. . . or No Cost

Try FREE 5 Days!

DON'T be unpopular, lonesome, or unhappy a minute longer. Now you can make your life what you want it to be—now you can win admiration, success and big money through the strange power of hypnotism. I'll show you how to use this great force to help you master every situation or *The Five Day Trial is FREE!*

In just a few hours I'll teach you the hidden secrets of Hypnotism—the methods used by the great operators, the amazing things you can accomplish once you understand this mighty power. You can use it to overcome obstacles, achieve your fondest ambitions and become MASTER of yourself, friends and acquaintances, either sex. See for yourself how Hypnotism can banish fear, worry and opposition—improve your memory, increase your earnings—and *force* others to give you the good things to life you deserve!

In his startling NEW book, *The Science of Hypnotism*, the world famous hypnotist—Prof. L. E. Young—reveals the most carefully guarded secrets of this fascinating subject. He not only explains the methods of noted hypnotists, step by step—but tells clearly all about the nine stages of hypnotism, the Hypnotic Mirror, Mental Telepathy, how to select your subjects, magnetic healing, methods of hypnotizing, how to waken the subject, how to make money out of hypnotism!

Try 5 Days FREE—
Send No Money

So confident are we that Prof. Young and his great book will quickly teach you the science of hypnotism, that we will send you a copy without one cent in advance! Simply clip and mail the coupon below. When the book arrives pay the postman the special low price of $2.00 plus few cents postage. Then test the powers of Hypnotism 5 days! If not amazed and delighted return the book and money will be refunded at once! Mail the coupon now.

FRANKLIN PUBLISHING CO.
Dept. W-421, 800 N. Clark St., Chicago

Mysteries of Hypnotism Revealed

How to Hypnotize at a Glance
Susceptible Subjects
How to Hypnotize by Telephone
How to Give an Entertainment
How to Make Others Obey You
Overcoming Bad Habits
How to do Dozens of Hypnotic Suggestions
Use of Hypnotism in Operations

Franklin Publishing Co., Dept. W-421,
800 N. Clark St., Chicago, Illinois.

Please send me your amazing new book—*The Science of Hypnotism*—by Prof. Young. When the book arrives I'll pay the postman only $2.00 plus postage. If I am not satisfied after 5 days' trial, I may return the book and you are to refund my money.

Name .....

Street and No. .....

Town ..... *State* .....

If you are likely to be out when postman calls, send $2.00 with coupon and we'll pay delivery charges. Customers outside U. S. must send cash with order.

ANDY'S SHOP MAIL BOX

(Continued from page 38)

Earl: Most advertisers insist on having their ads displayed next to reading matter, and you've got to show these advertisers some consideration or else charge more for the magazine. Put it this way, Earl: Would you rather pay a dollar for Double M, or continue the story on page so-and-so for two bits?

How to Be a Champion

YOU fellows may crab if you like about this sports stuff we've been running, but somebody's interested. Read this:

Dear Sir:

I have read with interest the article on swimming by Charles and Martha Norelius in collaboration with Bert Nevins, and would like to take the liberty of asking for further information.

Is it good to eat regularly on the day one is scheduled to compete in a race, and if so, what is the best kind of food to eat?

Furthermore, I'd like to know whether one should enter long distance races. Miss Norelius, who has been in the Wrigley marathon, can tell me whether it's too gruelling.

Yours truly,

B. EVANS.

Here are the answers as set down by Charles and Martha Norelius:

The question of diet before races is dependent upon the type of competition scheduled. If a person is going to enter a short race of 50 or 100 yards he may have no fear of what he may eat. However, regardless of the type of competition, one should make sure not to eat right before the race. At least two hours should elapse between eating and entering the water.

Should one be entered in a long distance race where a great deal of energy is needed, energy producing foods should be consumed. Most marathon swimmers eat a steak and plenty of sweets for breakfast on the morning of the swim, for red meat and sugar produce a great deal of energy. Before a long race one should be careful not to consume gas-producing foods, for stomach cramps are liable to result and cause one to be forced to quit the contest. No fried stuff should be eaten by swimmers before competition. For those entered in short races, let their meal consist of wholesome food such as cereal, fruit, etc., and for those slated for marathon swims, let their meal consist of energy-producing foods such as red meat, sweets and fruits.

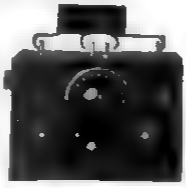
Long distance swimming is gruelling work, and only those hardened to endurance should tackle it.

(Continued on page 44)

AMAZING World Wide Aero Short Wave Receiver

Only $6.45

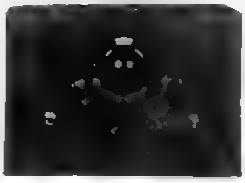
Listen in direct to London, Paris, Berlin, Buenos Aires



A new radio thrill for you. Span the world with this set. Enjoy unique foreign programs from strange lands. Hear broadcasting stations from all over the world, via short waves. Your ordinary receiver cannot tune in these low wave stations. World wide receiver gets 14 to 550 meter stations with surprising clarity. Price of set including 6 coils, $6.45, price in foreign countries, $7.75 postpaid.

AERO SHORT WAVE CONVERTER

Only $12.50



Convert your AC or DC radio set into a short wave Superheterodyne. With this converter on your regular set you will be able to tune in short wave stations from many different parts of the world. The Aero Converter contains its own filament supply. B voltage can easily be obtained from your regular set or you may use a single 45 volt B battery. No plug in coils. Single tuning dial. Very easy to tune. No whistles or squeals. Uses 2 UX227 tubes one as oscillator and one as mixer. Price, AC model less tubes ready for operation, $12.50, DC model for battery operated sets, $11.50. 2 matched UX227 tubes at 75c each, $1.50, one 45 volt battery $1.45.

ASTOUNDING AUTO RADIO BARGAIN

$20.00

This is the latest model 6 Tube Aero Pentode Auto Radio. Due to use of the latest Pentode tubes, this set is equal in performance to many 8 tube receiving sets. The circuit used is one which will be embodied in most of the expensive 1932 model auto radios. Complete set can be clamped on steering post of your car or can be operated by remote control from dashboard. Price of set only $20.00. Set complete with tubes, batteries, dynamic speaker, antenna equipment and noise suppressors, $39.50.

NEW AERO MIDGET

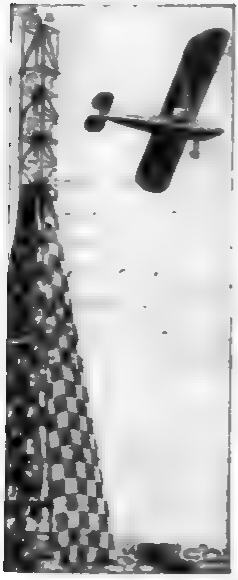
USING THE LATEST TYPE PENTODE AND MULTI-MU TUBES

Price $16.50. Here is a midget radio that everyone can afford that has performance, distance and tone qualities like the larger and much more expensive sets. Wonderful tone qualities and selectivity. Full dynamic speaker. Full vision dial. Beautiful walnut finish cabinet. This is a 5 tube set and sells for $16.50. Price of complete set of 5 tubes is $4.50.

Send for Latest Catalog of Parts and Equipment

CHAS. HOODWIN CO., Dept. M-70, 4240 Lincoln Ave., Chicago, Ill.

HEATH WINS AGAIN!



At Cleveland—as in each of the past five National Air Races—Heath planes won first place in all races for which they were eligible.

THIS old story merely proves again, in a dramatic and impressive way, that Heath builds light aircraft that fly and fly fast. And the world's altitude record, brought back from France in July, proves that Heath planes have "up-get."

You can buy a Heath ready to fly for $1074—or build it yourself easily at home from a special kit for $269—or assemble it from factory built parts for $549—all on easy terms.

Write today for full details, enclosing 15c.

HEATH AIRCRAFT CORPORATION

Dept. M-12 **Niles, Michigan**

A Christmas Treat from Santa Claus

"SANTA, old man," said we, "every mail brings us a bag full of subscriptions to Modern Mechanics and Inventions — seems that every up-and-coming person in the country has decided that the magazine is a humdinger of a Christmas gift. Now, Christmas isn't so far away and we want to give these subscribers a nice present ourselves—something extra good. What have you in your pack?"

"How about a copy of **How to Build It,** the big book of home workshop plans?" said Santa. "Or the **1931 Flying and Glider Manual,** full of airplane plans? I'd be tickled pink to slip a copy of either of these books down the chimney with each yearly subscription to

MODERN MECHANICS AND INVENTIONS

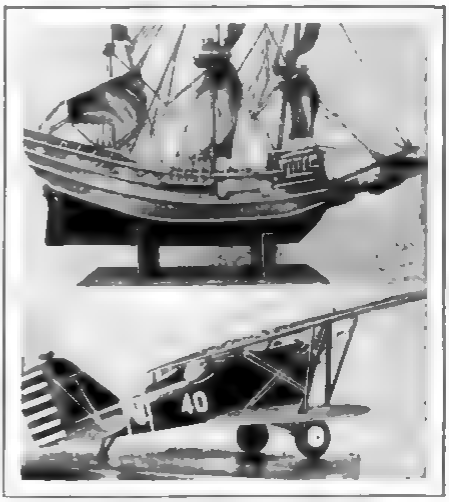
So that's how we arranged it—with each yearly subscription to Modern Mechanics and Inventions, at $2.50 ($3.50 in Canada) we will send absolutely free a copy of **How to Build It** or the **1931 Flying and Glider Manual.** Be sure to specify which book you prefer. Better yet, subscribe for two years at $5.00 and receive both books free. A beautiful Christmas gift card will be mailed, if you request it, to the individual for whom the subscription is intended. Send check or money order to

Modern Mechanics and Inventions
529 S. Seventh St., Minneapolis, Minn.

ANDY'S SHOP MAIL BOX

(Continued from page 42)

A Pair of Nice Models



230 Euclid Ave., Mt. Clemens, Mich.

Dear Sir:

I am sending you two snapshots. One is a Curtiss Hawk army plane and the other is H. Hudson's Half Moon. The plane is a perfect scale model with a 24-inch wing spread. It has a hollow fuselage, controls, gas tank, and instruments. It took me one year to make the ship model in my spare time.

I have been reading your book ever since it came out and I think it's the best. I can hardly wait for the next one to come out.

Thank you,
MURL DEDENBACH.

The pleasure is all mine, Murl. Here's the pictures you sent.

"Pick YOUR Government Job"

Work for Uncle Sam. Get good pay, regular increases, vacations and sick leave with pay. Steady advancement, pension. Send for my free book *"How to Secure a Government Position"*—tells about all jobs, near home or traveling, the money, what you need to know and how to get posted. Forget "job hunting." Open to citizens 18 to 50. **IMPORTANT** Get ready NOW for the next Railway Postal Clerk Examinations. Yearly pay with allowances averages $2759.00. Prepare yourself NOW. Send coupon at once.

A. R. Patterson, Civil Service Expert
PATTERSON SCHOOL, 4312 Wisner Bldg., Rochester, N. Y.
Please send me, without obligation, your free book "How to Secure a Government Position."

Name ....

Address ..

Mystery "TWIN-RAY" Light Tested—Reads Newspaper At 1,000 Feet!

SEVERE TEST GIVEN NEW SAFETY LIGHT

June 8th: A demonstration of the new Auto Safety Light, designed for safe night driving, was given at the Boston airport on Friday night before an interested gathering of pilots and automobilists. The first test was the ability to read any part of a newspaper at a point of 1,000 feet in front of the light and a foot above the ground, provided that while the ground in front of the light was perfectly illuminated, the rays from the light were at no point above the center of the light itself. Consequently there would be no glare to an on-coming car, showing the light powerful enough to penetrate the lights of the on-coming car and show clearly the road beyond and any obstacles in it.

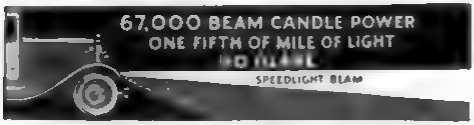
Lights Highway Ahead With 67,000 Candle Power Beam

Reporters for the Boston Sunday Post witnessed a demonstration of this light and above is a reprint of their report.

Now—judge for yourself what you can do with a light like this on your automobile—a light that throws a 67,000 candle power beam for over 1,000 feet—lights up all road signs and curves long before you reach them. Makes the road ahead of you as bright as day yet absolutely can't glare in the eyes of approaching drivers. A road light that literally takes the light out of the sky—all light on the highway. Past night driving now safe with this amazing Speedlight—you can drive 50-60—even 70 miles an hour with perfect safety. On a road as brilliantly lighted at midnight as at mid-day. Cuts through fog, rain, and darkness. This "twin-ray" road light not only can't glare itself but it cuts through on-coming brights. No wonder it was awarded the grand prize and two gold medals in world competition.

AGENTS Cleaning Huge Profits

Agents and distributors from coast to coast are making big money equipping passenger cars, buses and trucks with this brand new road light. This is your opportunity to make up to $10-$20-$30 per day. Some agents make even more. Kinney made $96 in a few hours. Frost made $150 in one day. Burroughs sold fifty lights to Richmond fire and police departments. Over 20 million cars need this wonderful light to protect human lives and property against glaring lights, fog, rain and darkness. Hundreds of men have made big fortunes out of makeshift spot lights and painted bulbs that only did half the job. Send the coupon and find out how you can use this great device to build up a crew of your own—and double your earnings—earnings which by themselves will be bigger than you ever saw before. Do it now, before you turn this page.



Cuts Through London Fog and Darkness Like a Knife

Tests in England have proved this. With this light you need have no more fear of fog, rain or darkness. There is no light like it in the world. It is not a spot. It embodies an absolutely new principle in headlighting discovered by a famous light engineer. NOT A PAINTED BULB—But a real scientifically constructed road light with a concentrated 67,000 candle power beam of light on the road for over a thousand feet and no glare. Think of it! Over a fifth of a mile. Put one on your car and see for yourself what you can do with a light like this. Send the coupon today for our introductory offer.

SPEEDLIGHT COMPANY

1731 Belmont Ave., Dept. 50-W, Chicago, Illinois

TO GET THIS LIGHT

FREE of Extra Cost

DON'T TURN PAGE—

MAIL THIS COUPON FIRST

SPEEDLIGHT COMPANY,
1731 Belmont Avenue,
Dept. 50-W, Chicago, Illinois.

Without obligation to me please send me full details of your Speedlight and your wonderful introductory offer.

NAME. .. ..

ADDRESS.....

CITY.....STATE... ..

Amazing Turbine-Rocket

So-called "meteor islands," which can carry sun-reflecting mirrors and scientific instruments, can be established by shooting rockets at a 5-mile per second speed. Reaching a height of 65 miles, they would keep circling the earth, never coming down.

Prof. R. H. Goddard, famous rocket experimenter, has just patented a remarkable turbine-rocket which makes the age-old dream of traveling in space mechanically possible. Details of this astonishing invention and of other experiments which pave the way for regular lines of ships traveling through the earth's stratosphere at 1000 miles an hour are presented in this absorbing article.

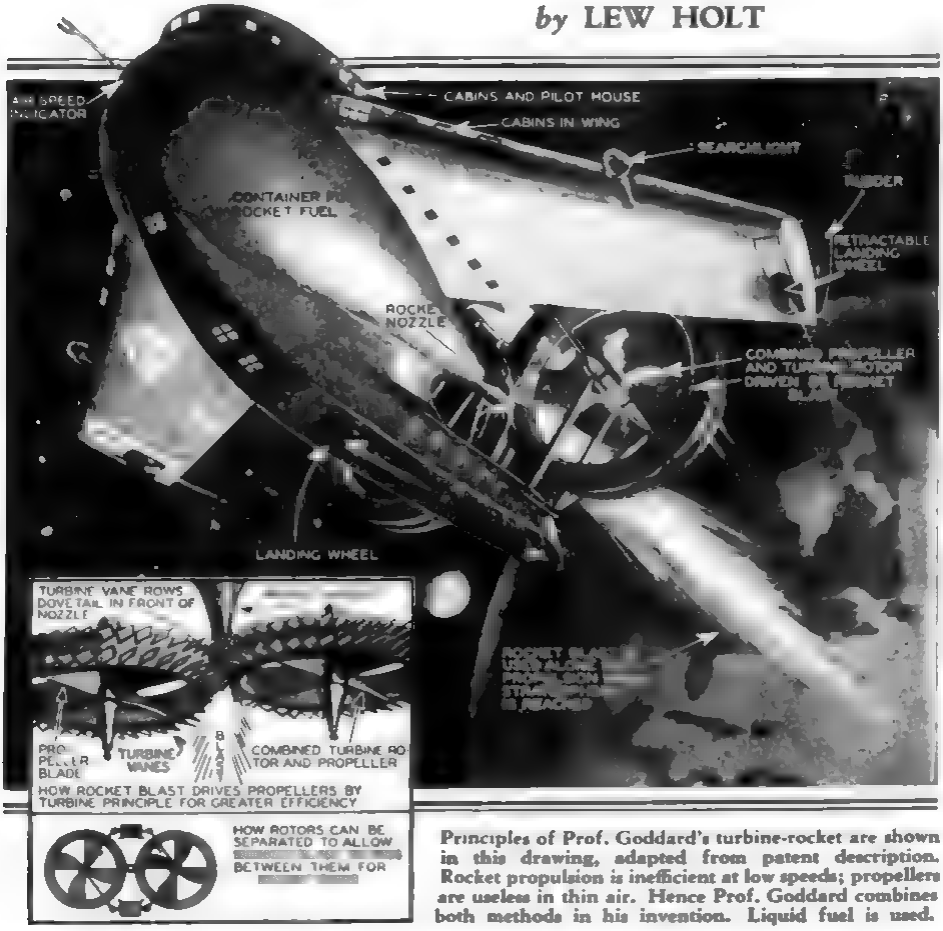
Prof. R. H. Goddard shown with a rocket model.

DOWN in a secluded section of New Mexico a scientist who has for years been experimenting with rockets has succeeded in devising a mechanism combining the principles of the rocket and the turbine, giving the world an entirely new vehicle of transportation capable of traveling hundreds of miles above the earth's surface—and perhaps, some day, of making a trip to the moon or nearby planets.

The scientist who has brought Jules Verne's moon trip a step nearer reality is Prof. R. H. Goddard of Clark University, who has just received a patent on his turbine-rocket airplane. He himself makes no claim that his machine will reach the moon—that statement comes from other enthusiastic scientists who see in his invention amazing possibilities of travel in outer space. Prof. Goddard has designed his ship

to EXPLORE Outer SPACE

by **LEW HOLT**



Principles of Prof. Goddard's turbine-rocket are shown in this drawing, adapted from patent description. Rocket propulsion is inefficient at low speeds; propellers are useless in thin air. Hence Prof. Goddard combines both methods in his invention. Liquid fuel is used.

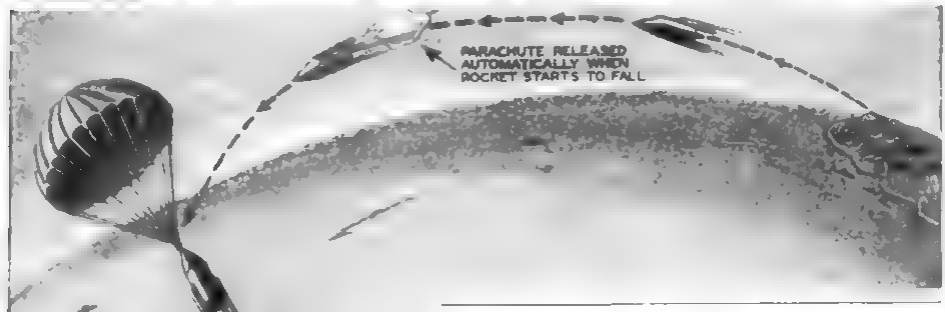
to travel in the earth's stratosphere, which includes that layer of exceedingly thin air, trailing off into utter vacuum, which exists beyond ten miles above the earth's surface.

It is the combination of propellers and rockets which makes Prof. Goddard's ship unique. Rockets are the most efficient form of propulsion known for high speeds, meaning speeds in excess of 600 miles an hour. Airplane propellers are efficient at slow speeds and in dense atmosphere, but lose their effectiveness when the air thins out at high altitudes. Therefore Prof. Goddard combines these two forms of propulsion, as explained in the drawing on this page.

In beginning its trip from the earth, the rocket blast of the ship is directed through turbine blades which drive propellers. This drive is used when traveling through the comparatively dense atmosphere close to the earth. But when the higher altitudes are reached, the propeller turbines are swung out of the course of the rocket blast so that the ship is driven by rockets alone. Thus the two forms of power are used under their most favorable conditions.

Whenever the subject of rockets is mentioned, the imagination conjures up pictures of journeys to the moon and planets.

German Mail-Line Rocket Perfected, Landing Self by Use of Parachute



Accurate control of rocket flights and automatic parachute releases to lower the cylinders at the end of the trip make trans-Atlantic mail lines possible.

Above rocket, equipped with a 'chute, has been successfully tested by Wilhelm Belz, German engineer.

Scientific skeptics have always maintained that such ideas are fantastically impossible, but much of this criticism has been quieted recently by the experiments of Goddard and others. German experimenters, particularly, have perfected rockets to such an extent that one group has already charted a course from a field in Germany to one near New York, over which course rockets carrying mail or merchandise will travel. Parachutes opening automatically at the end of the journey solve the problem of landing the rocket and its contents safely.

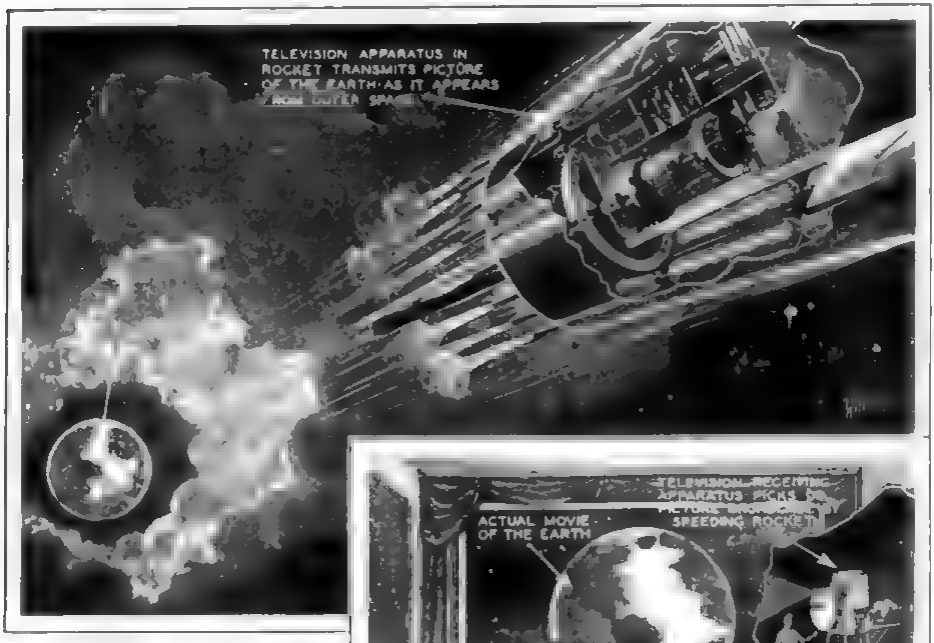
Fuels employed in driving rockets are of liquid composition. Explosive powder is definitely out of favor. Prof. Goddard uses gasoline mixed with liquid oxygen. A favorite fuel with German experimenters is liquid oxygen and liquid hydrogen, brought together through separate pipes and ignited.

Germany has a Rocket Flying Field near Berlin especially devoted to rocket experiments, under the direction of Herr Rudolf Nebel, whose ultimate aim is to build rockets that will pierce the stratosphere and reach other planets. This end will be approached gradually, however. First Herr Nebel plans to build a rocket to shoot into the stratosphere, carrying scientific instruments; next, a rocket to shoot to Cologne, and after that a trans-Atlantic rocket to deliver mail in New York or Chicago in half an hour.

The creation of "meteor islands" outside the earth is an interesting possibility opened up by these rocket refinements. It is a well-known fact that an object hurled into the air at a speed of some six miles an hour will, after reaching an altitude of 65 miles, remain there forever, traveling around the earth. Owing to the earth's curved surface and its rotation, the object cannot come down.

Such islands in space, Herr Nebel declares, can be devoted to innumerable purposes. Fitted with huge natrium mirrors, they can divert the sun's rays to illuminate the earth at night. They can be fitted with astronomical instruments. They can be used as stopping points for rockets

"See the Earth as Other Planets See It"—via Ingenious Television Rocket



Experts who have listened to the plan of Maxium Pudovkin for placing television apparatus in a rocket for a long-distance view of the earth agree that the idea is far from fantastic. Rockets can be accelerated gradually so shock of explosion would not destroy the apparatus.

carrying passengers into space, and can be outfitted with provisions to sustain a staff of scientists. Fantastic? Certainly—but not impossible.

Some day you may enjoy the thrill of watching a motion picture of the earth, transmitted by television from a rapidly moving rocket in outer space! A record could be kept by photography.

Still another use for rockets would be to give us a long-distance view of what our earth looks like from outer space. Maxium Pudovkin, a young Russian engineer and inventor, has proposed that television equipment be installed in a rocket and a moving-picture of the earth be projected from it as the rocket travels toward the moon. The practical man may object that a rocket's vibration would destroy delicate television equipment, but as a matter of fact rockets are now so well designed that they start with less jerkiness than an ordinary airplane. The value of a "space-visor" in checking up on maps and geographies is self-evident. It would be a simple matter to keep a photographic record of the television image.

Although Prof. Goddard will not predict the exact distance which his turbine-rocket airship would be capable of traveling, in a paper written some years ago he proved that a series of rockets, one within the other, each fired as the one below became empty of fuel, could reach an indefinitely great height. It is uncertain when a turbine-rocket will be built from Prof. Goddard's plans, although models have already been constructed. In one model the turbine blades, of thin steel, were insecurely mounted to the rim, and they were thrown more than 50 feet by the high speed produced by the rocket blast. The speed of the rocket, where maximum efficiency is produced, will be in the neighborhood of 3000 miles an hour. Even at this great speed it would take 80 hours to reach the moon.

Water Sports Fans Race in Novel Hand-Powered Craft

New Berlin water sports racing boat, powered by hand crank geared to propeller on rear. Racer reposes comfortably on head rest while operating the crank.

THE newest water sport in Berlin swimming pools is handicap racing with the recently-introduced "grinding wheel" boat weighing but six pounds and measuring a yard in length. On the water speedway the racer places his head and arms in the openings as shown in the accompanying photo and proceeds to grind away toward the goal.

The cranks of this unique racing boat are connected through what looks like a grindstone to the propeller blades in the rear, which drives the craft forward at a speed sometimes as high as 10 and 15 miles per hour.

Drug Now Solves Murder Mysteries

BAFFLING murders may now be solved simply by giving the suspect a drug recently developed by University of Chicago chemists. The drug depresses the nervous system and causes forgetfulness, thus breaking down truth-telling inhibitions and causing the patient to tell the truth in spite of himself. This drug will not be welcomed by lots of fishermen we know.

New Plane Has Extensible Wings

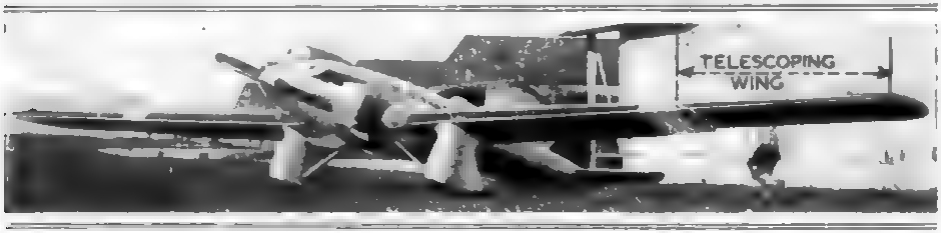
BELIEVED to be the greatest aid to aviation in years, a new plane has been developed which has wings that can be extended or contracted by control from the cockpit. Resembling a telescope in operation, the wings have a spread of 68 feet when extended and only 36 feet when contracted.

In the former position the plane has a speed of 106 miles per hour, while in the latter the speed is raised to 186 m.p.h. The plane is powered with a 450 h.p. motor and is the invention of M. Makonine, a Russian.

Bear Skin Garb Boosts Gas Sales

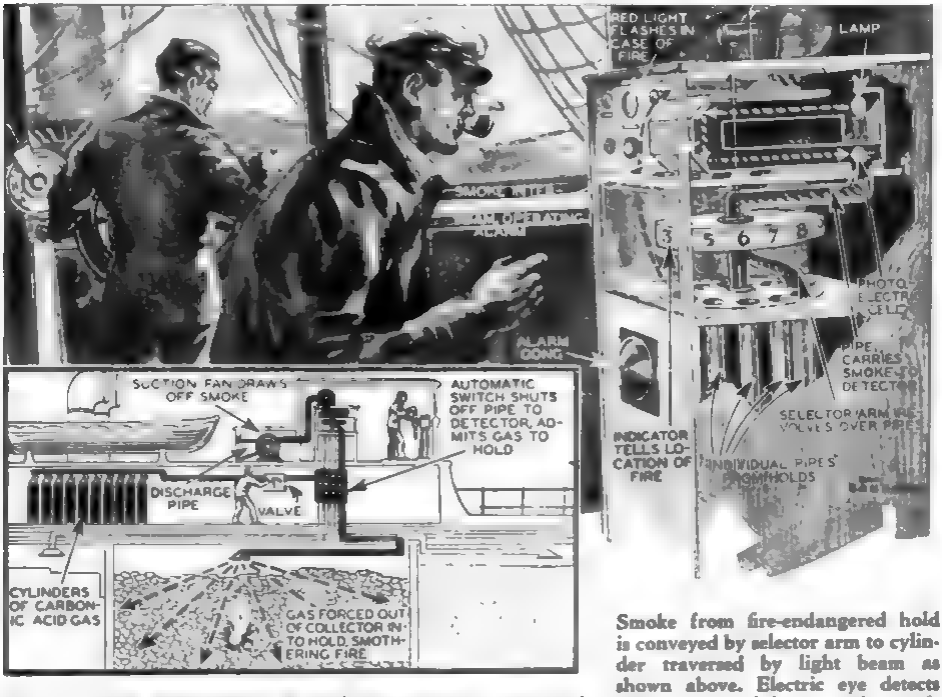
Not a real bear, but a garage owner dressed up to attract trade to gas station in Thuringia, Germany.

TO ADD to the scenic effects of his gas emporium, a garage owner in Thuringia, Germany, has bedecked himself in a bear skin. Thus he is able to provide his customers with both amusement and engine juice, to say nothing of the extra remuneration which accrues to himself in the deal.



Telescope wings of this new plane permit a wing spread to be contracted from maximum of 68 feet to minimum of 36 feet, with 106 m.p.h. speed in the former position, and 186 m.p.h. in the latter.

Electric EYE Fights Ship Fire with GAS



Fire is quickly extinguished by carbonic acid gas, conveyed to hold by collector pipes as illustrated in the drawing above.

Smoke from fire-endangered hold is conveyed by selector arm to cylinder traversed by light beam as shown above. Electric eye detects interruption of beam and sounds alarm to the officer on watch.

THE ubiquitous electric eye has now been put to use by an English shipping company to detect and extinguish fires in the holds of the vessels at sea. Since it discovers flames when they are just breaking out, this new installation, known as the Radiovisor Smoke Detection System, gets at the incipient blazes and thus prevents them from reaching disastrous proportions on a ship.

Smoke from a fresh fire is sucked up through a collector and conveyed to selector which revolves slowly over the ends of the tubes, as illustrated in the drawing above. When the selector passes over a tube leading from a hold where the cargo is afire, it conveys the smoke to a U-shaped cylinder traversed by a light beam. The electric eye on duty detects the smoke by the interrupted beam and proceeds to set up an alarm.

At the fire alarm signal, the mate on watch opens a set of valves leading from a row of carbonic acid gas cylinders, the gas being conveyed to the endangered hold through the pipes which served to draw up the smoke.

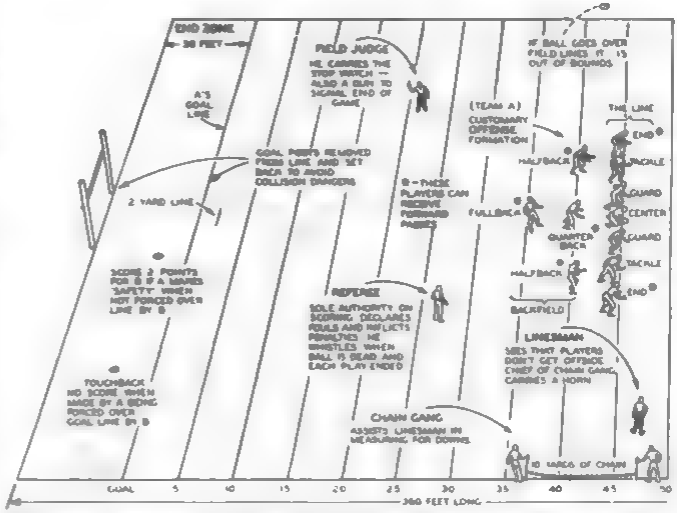
New Glareless Auto Headlights

TAKING a hint from the eye shade made popular by Helen Wills Moody, Frank R. Dudley, of Fitchburg, Mass., has invented a glareless head light. Located on the cowl, as shown below, the shade stretches along hood to direct rays downward on roadway.

Inventor F. R. Dudley with glareless headlights.

GRIDIRON STRATEGY

THE player who calls signals for his team in a football game follows certain definite directions from his coach in directing the attack. These principles vary with different mentors, but broadly speaking, they are much the same, as attack is governed to a great extent by the four zones of the field. Thus, the spectator who wishes to get full enjoyment from the game should know what type of plays to expect in these zones. A study of the diagram below will give you this information at a glance.



The above diagrams of the field will aid the inexperienced spectator to

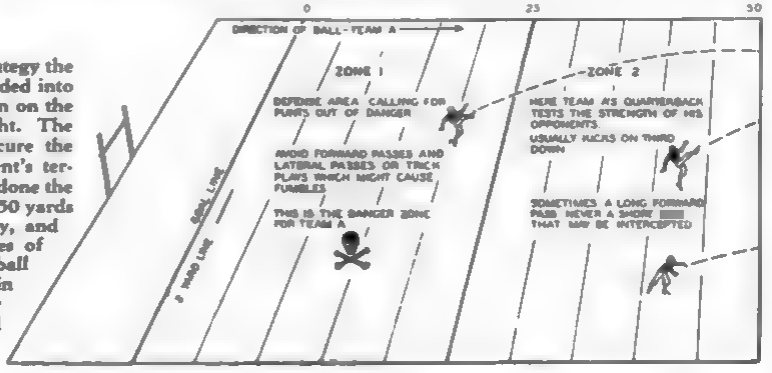
When watching the team with the ball, center your attention on the two lines of scrimmage. If you see two of the forwards so stationed that only one opponent plays opposite them, you can expect the offensive team to strike at this point.

Defensive end play will also tip you off as to what to expect. Suppose a team has been gaining off tackle. Sometimes the opposing end on that side will move in closer to his tackle. What more simple than to run a play around him or drive one inside the tackle should be play farther out to stop smashes outside him.

The ideal time to look for a pass is when the defensive center is in the line of scrimmage, as there are then only four men to cover the five eligible receivers.

The down and distance to play is about as important as zone position. For example, if a team has the ball at midfield on third down with but one yard to gain, it is not difficult to tell what sort of mentality its coach and quarterback possess if they try to gain this yard by a line buck through center. The defense will naturally expect such a play and will drive with all its power to stop it.

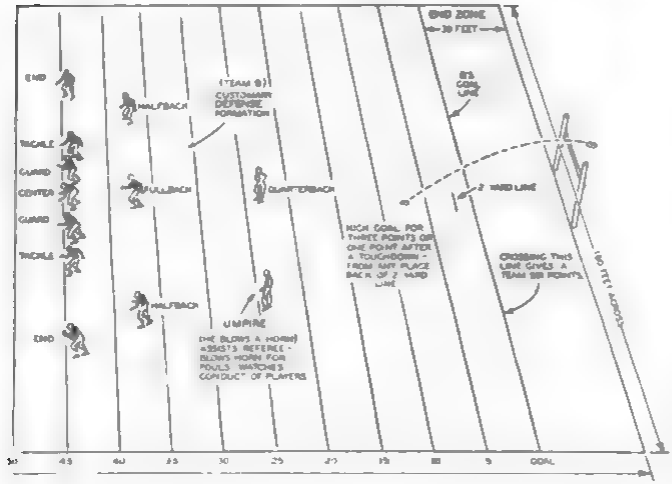
The smarter elevens will attack off or inside tackle or even use a forward pass or reverse play under these conditions. When the defense is set to stop a plunge of a yard or so through center, that is the time to strike off center or execute a forward pass.



For purposes of strategy the football field is divided into four zones, as shown on the diagram at the right. The basic idea is to secure the ball in the opponent's territory. Once that is done the attacking team has 50 yards behind it for safety, and it may use all types of plays, as a lost ball does not place it in immediate danger of being scored upon.

Made SIMPLE

Pointers on football that will help you appreciate the game



better understand the game. (Courtesy "How to Watch Football".)

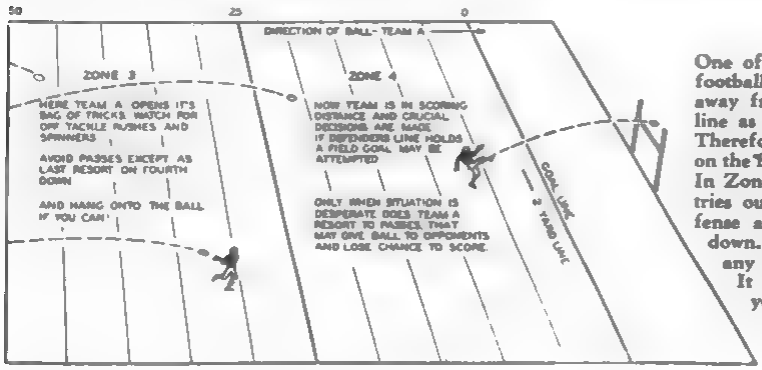
Some of the strongest and most invulnerable systems of play have been based on the kicking game. Harvard under Haughton, and California under Andy Smith, reached their highest pinnacles in football success because these two coaches compelled their players to master the kicking game. Both of them knew that if they could gain ten yards on an exchange of punts, the thing to do was to keep on punting. In that way the position of the ball would gradually be moved forward and they would eventually obtain possession of it around mid-field where they could launch all of their plays. Furthermore, as their backs had not been running with the ball they would be fresh at this important time to use in attack. Too many teams have been exhausted by running with the ball deep in their own territory.

But all of these rules of attack are not always followed. If a team is behind with but a few minutes to play and has the ball deep in its own territory, it would be foolish for it to punt, as it would lose possession of the ball, and with it all chances to score. You may expect any play at that time, even forward passes on all downs. It has to take long chances.

Likewise, when a team is leading near the end of the game and has the ball in its possession in its own territory, it would be poor policy for it to punt until compelled to on the fourth down. A quarterback knows that at such a time, should the opponents secure the ball, all sorts of tricks are likely to be tried. So it hangs on as long as it can.

In watching the game today, one can smell a forward pass almost the instant the ball is snapped. Don't watch the runner but watch the two ends. If one of them, or both, start down field or out toward the side at full speed, immediately note how the backs are running. The ends may be the decoys to draw away some of the defensive backs in order that the backs of

(Continued on page 192)



One of the stable rules of football is to get the ball away from your own goal line as quickly as possible. Therefore most teams punt on the first down in Zone 1. In Zone 2 the quarterback tries out the opposing defense and punts on third down. Beyond mid-field any plays may be used. It is in this zone that you may look for all kinds of trick plays and formations.

Special Illuminated Bridge Table Lessens Eye Strain

25-watt light on nickel-plated pipe support gives adequate illumination to the card table, while shade keeps light from player's eyes. At end of game the table is folded up as illustrated at the left. Adjustment of thumbscrew keeps parts under table.

IDEAL illumination for the bridge game is provided by a new illuminated bridge table now being marketed. In opposite corners, small sections of nickle-plated pipe, with thumb screw joints for adjustment, support lamp sockets and trough reflectors which accommodate 25-watt mazda lamps. As these reflectors are located slightly below the eye level, the light is concealed from the players' eyes and directed downward on the playing area. A uniform distribution of light results, as is shown in the photo at the left.

A simple adjustment of the thumb screws permits the complete assembly to lay snugly against the bottom of the table.

New Card for Bridge Players

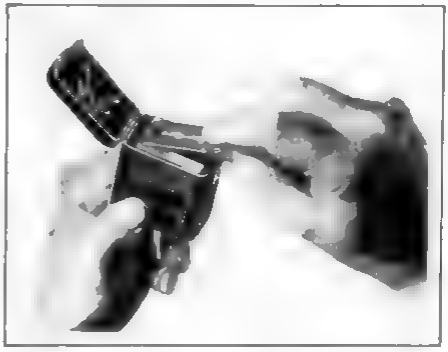
A NEW kind of playing card is soon to come into popular use, according to an eminent bridge authority. These cards are to be longer than the customary card and the suits will be in different colors. Hearts will be red, diamonds pink, spades black, and clubs dark green.

Blind Sign Names With Stencils

A SPECIAL stencil which enables blind persons to sign their names instead of making the customary cross has been devised by a Houlton, Maine, jeweler. Cut out of thick gauge metal, the letters are traced with an indelible pencil to indite a clear signature.

Blind persons sign their names by tracing out letters on stencil with pencil. Sandpaper on back prevents slipping.

Powerful Magnet Sharpens Blades



Powerful magnet in new sharpener pulls microscopic blade teeth into alignment to sharpen.

CONSISTING of a small case containing a magnet of alloy steel terminating in two poles to hold the blade, a new sharpener for safety razor blades automatically keeps the blade sharp-edged for many more shaves than usual, no stropping or other form of hand manipulation being required.

Before each shave, the blade is placed in the case across the poles of the powerful magnet, and the cover is closed. Then the cover is opened, the blade turned, the cover closed for a moment again—and the blade is ready for use. The operation is completed in six seconds, and the result is a blade sharper than its keenness when new.

Following Black Lines on Indian Design Cures Insomnia

THE Indians may not have known much about science, but they are able to tell scientists something about getting to sleep after a busy day on the warpath. Their favorite method, which they are now offering to nerve-wracked moderns, was to follow with their eyes the devious lines of a complicated pattern, one of which is shown in the photo at the right.

If you are troubled with insomnia, try this method on yourself. Simply take a sheet of cardboard about 12 in. by 18 in. and paint on it the lines illustrated in the photo. Five to ten trips around will bring slumber.

Following lines on this design five or ten times at night will induce sleep. This method was employed by ancient Indians.

"Man-Made Fur" Has Fabric Base

Herbert J. Hope with his "man-made fur," woven on special loom from angora hair with fabric base.

HERBERT J. HOPE, veteran loom designer of Sanford, Me., has succeeded, after ten years of effort, in weaving "man-made fur". Employing a special loom, he weaves shorn angora hair on a fabric basis, thus eliminating killing the animal.

Rats Gnash Teeth When Happy

IF YOUR pet rat gnashes his teeth at you that does not mean that he is getting ready to bite. It means, on the contrary, that he is feeling comfortable and friendly, like a purring cat, according to an eminent authority on rats.

"Clicking of the teeth," he says, "is the rat's method of expressing contentment and happiness. This habit is universally present among albino rats and is significant of a friendly, pleased frame of mind. Rats that are accustomed to being handled and caressed invariably show their satisfaction by making this clicking noise with their teeth."

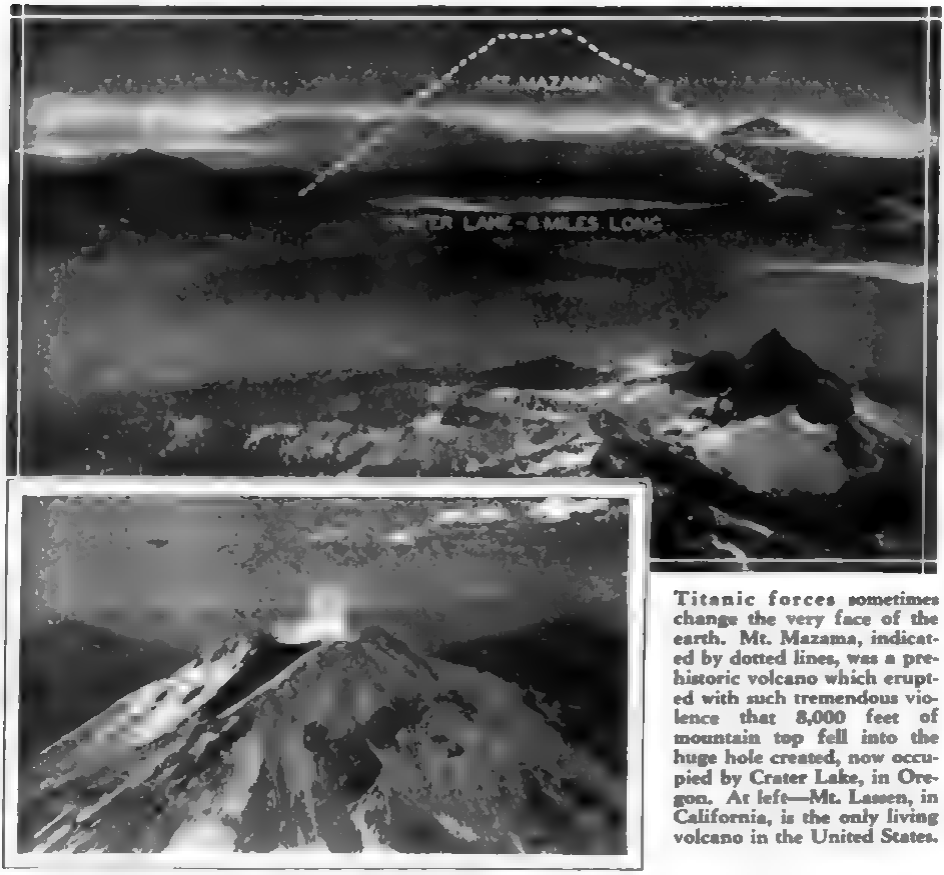
Rats are very susceptible to soft music.

Outboard for Toy Speed Boats

A TOY outboard motor, a replica of the famous Johnson "Sea-Horse", is now being marketed for use on toy speed boats. Powered by a clock movement, it will run three to five minutes in a pool, tub or what have you. A toy speed boat for use with the motor is also available. Motor is detachable.

The new clock spring-powered "Sea-Horse" motor for use on toy boats.

Earthquakes Reveal Secrets



Titanic forces sometimes change the very face of the earth. Mt. Mazama, indicated by dotted lines, was a prehistoric volcano which erupted with such tremendous violence that 8,000 feet of mountain top fell into the huge hole created, now occupied by Crater Lake, in Oregon. At left—Mt. Lassen, in California, is the only living volcano in the United States.

WHEN Old Mother Earth shakes herself with a good healthy earthquake shake she may be only readjusting herself to things that happened perhaps 3,000 million years ago when the moon broke free and left behind a hole which gradually shrank and became the Pacific Ocean.

That interesting theory was just one of the many discoveries about the earth and earthquakes presented before the recent meeting of the American Association for the Advancement of Science.

And not only did the moon in breaking away from the earth set up stresses and strains which may still be unadjusted, but even at her present distance of 240,000 miles she continues to cause earthquakes. Dr. Arthur L. Day, director of the geophysical laboratory of the Carnegie Institution of Washington, Dr. Beno Gutenberg, geophysicist of California Institute of Technology, and Maxwell W. Allen reported their studies of earthquakes and their causes.

Dr. Gutenberg described the action of the moon, piling up millions of tons of water in the tides which move around the earth, creating an enormous moving load which acts as a trigger to touch off forces which have gradually accumulated deep in the earth.

Dr. Allen found there is a definite relation between the passage of the moon overhead and the time of both minor and heavy

# of EARTH'S INTERIOR

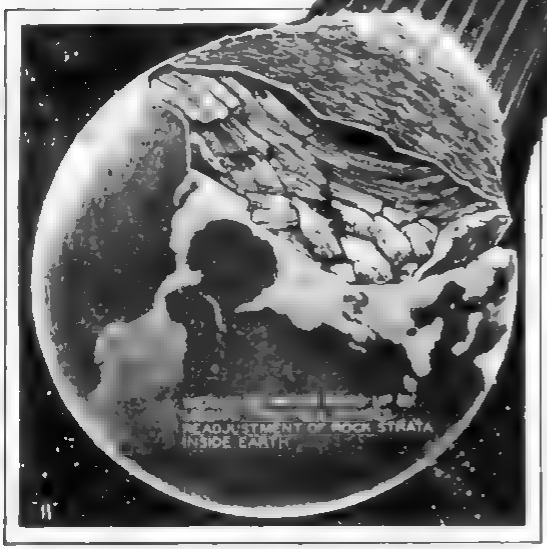
by JAY EARLE MILLER

An earthquake is simply the earth's method of adjusting itself to stresses and strains in its "innards." Just how a quake can present to scientists a complete picture of the composition of the earth's interior is explained here.

Many scientists believe the moon was pulled from the site of the Pacific Ocean, and that earthquakes are still compensating for that strain.

earthquake shocks. About five hours after the moon has reached its highest point in the sky, and again slightly more than twelve hours later, when the moon is on the opposite side of the earth, are the two critical periods for minor shocks. Probably, according to Dr. Allen, there is some critical point at a relatively shallow depth in the San Jacinto fault, in the Mojave desert, which is touched off by the tidal strains. Strong shocks, on the other hand, usually take place a few days after the moon is either new or full. Evidently the critical spot in this case is much deeper and more plastic, so that the regular daily strains can deform it without causing a shock, and only the accumulated strains of the tidal pull over a considerable period is able to furnish the necessary trigger.

The relation of the moon to quakes, or the fact that the moon probably came out of the space now occupied by the Pacific ocean are not new ideas to science, but with new instruments and further study there is a growing possibility that the time is not far distant when earthquakes may be predicted in advance, and steps taken to guard against them.

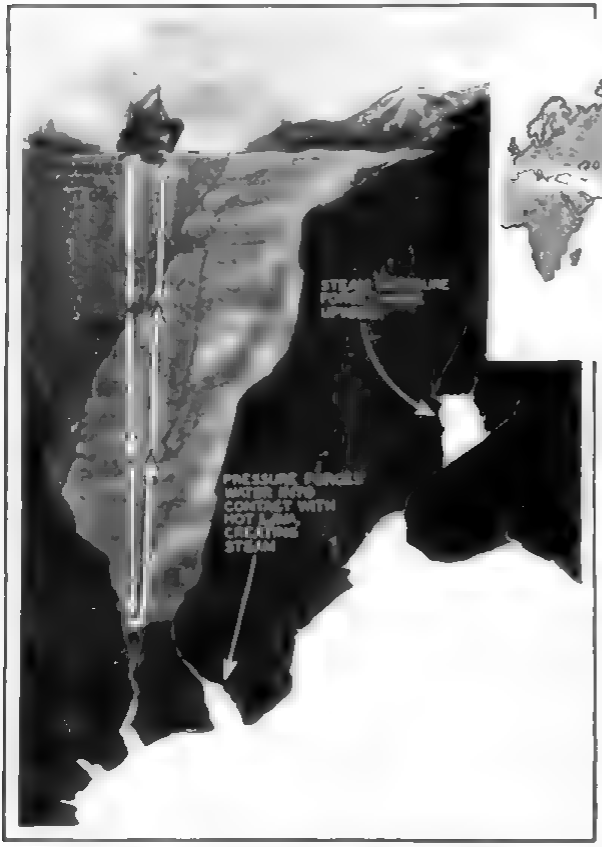


Earthquakes show a definite relation to passage of the moon. Probably the immense weight of tides set up by the moon acts as a trigger to set off quakes, deep inside the earth.

Montessus, who compiled a colossal map of 160,000 earthquake shocks, extending over all the period of recorded history, discovered that 91 per cent of them occurred in two narrow belts along great circles of the earth. One of these belts is called the circum-Pacific circle, for it follows, more or less, the borders of the Pacific ocean, and probably represents the direct strains left by the moon's departure. The second earthquake belt, the Mediterranean, or Alpino-Caucasian-Himalayan circle, crosses the first in the south seas, and includes the famous volcano zone of Iceland and Jan Mayen Island, in the Arctic.

The why of an earthquake goes back to the very foundation of the earth. Presumably, according to

Pressure of Water in Ocean "Deeps" May Cause Certain Earthquakes



According to Capt. T. J. J. See, certain earthquakes near ocean "deeps" are caused by water being forced under immense pressure against hot rocks, creating steam which forces land upward.

Major earthquake areas of the world are included within the yellow lines. The great circum-Pacific belt, scene of major quakes, represents strains left by loss of the moon from the Pacific, according to one theory.

science, at some distant date, anywhere from 1,500 to 3,000 million years ago, a large star passed quite close to the sun and piled up such a tremendous gaseous tide on the sun that it pulled a part of the sun away and formed the earth. The combined gravitational pulls of the sun, the nearby star, and perhaps other stars and some of the older planets, plus the resistance of some of the surrounding gases which did not cool rapidly and solidify into the rapidly-forming mass, resulted in giving the new-born planet a more or less circular orbit.

As the new earth began to cool and liquefy troubles appeared. In cooling it shrank, and as it shrank its speed of rotation increased. One of two things may have happened. The sun, playing the part of the first star, may have pulled out the satellite, or, as G. H. Darwin suggested, the period of vibration of the earth may have at some time been exactly equal to its period of revolution around the sun, so that, as a result of resonance, the sun raised enormous tides on the earth, which eventually caused it to divide.

In any event the division must have occurred within a few years after the birth of the sun, judging from the comparative size of the earth and moon, the former having a mass eighty-one times the latter. If the sphere had been completely liquid the two masses would be equal, and the greater the proportion of liquid matter to solid the larger the satellite will be.

The belief that the Pacific Ocean is the hole that the moon came out of does not mean that the moon could be put back into that space. The Pacific, big as it is, with a volume of 167,360,000 cubic miles, would not begin to hold the moon. Of course the earth has shrunk considerably since the moon was born, and it is also possible that the Pacific was once much larger. There is considerable evidence that the continents themselves have not always been where they now are. Rocks and fossils of Africa and South America are so much alike, and the shape of their east and west coasts so closely resemble each other that there is a

Much evidence indicates that the American continents are drifting westward. Note how neatly the Americas dovetail with Africa and Europe.

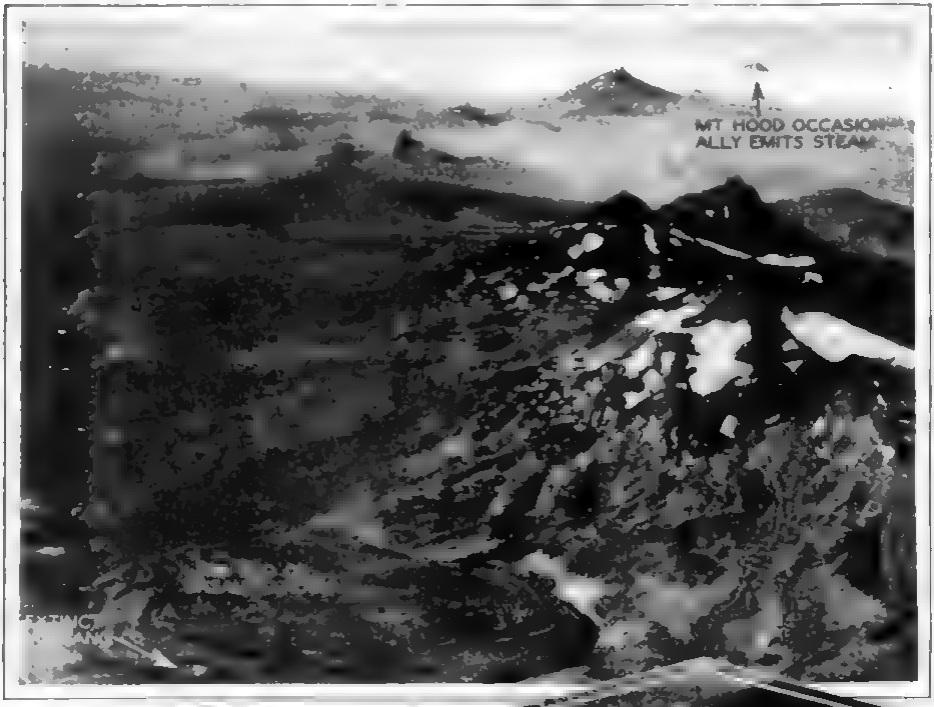
strong probability the two were once joined, and that North America at that time was joined to Europe. That drifting continent theory which has been partially supported by recent observations, may be the answer to the old mystery of the lost continent of Atlantis.

In its early days the moon was quite close to the earth, and exerted, therefore, a much greater tidal pull than it does today. It has taken at least 1,500 million years, according to best estimates, for the moon to recede to its present distance of 240,000 miles. As the earth cooled and liquefied the heavier matter, mostly iron, naturally gathered at the center and the lighter materials floated on top. Geologists and geophysicists now believe that the earth at present is a series of concentric shells around a molten or at least plastic ball of iron about 4,400 miles in diameter. Floating on the iron core is a shell of dunite some 1,800 miles thick. Outside of that is

Latest theory of the composition of the earth. The central iron core, losing its heat, shrinks and outer layers collapse, causing earthquakes, say scientists.

a tochylite or diorite layer of about 12.4 miles, or twenty kilometers, a granitic layer of about 6.2 miles, and an outer shell of sedimentary rock of about 3.1 miles.

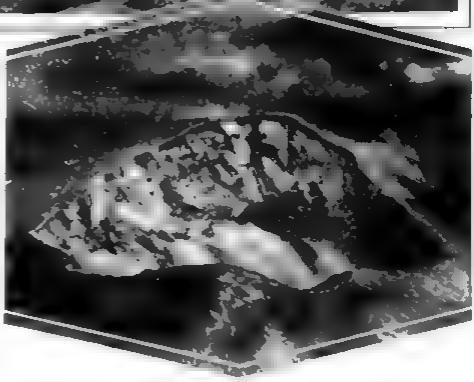
The molten interior, however, continues to lose its heat and to shrink, leaving the outer shells unsupported. They must then collapse and contract, and that, in the opin-



Note extinct crater, lava bed, and dead volcanic peaks in this air photo of the Cascade range in the great circum-Pacific circle of volcanic and earthquake activity. Taken from 20,000 feet.

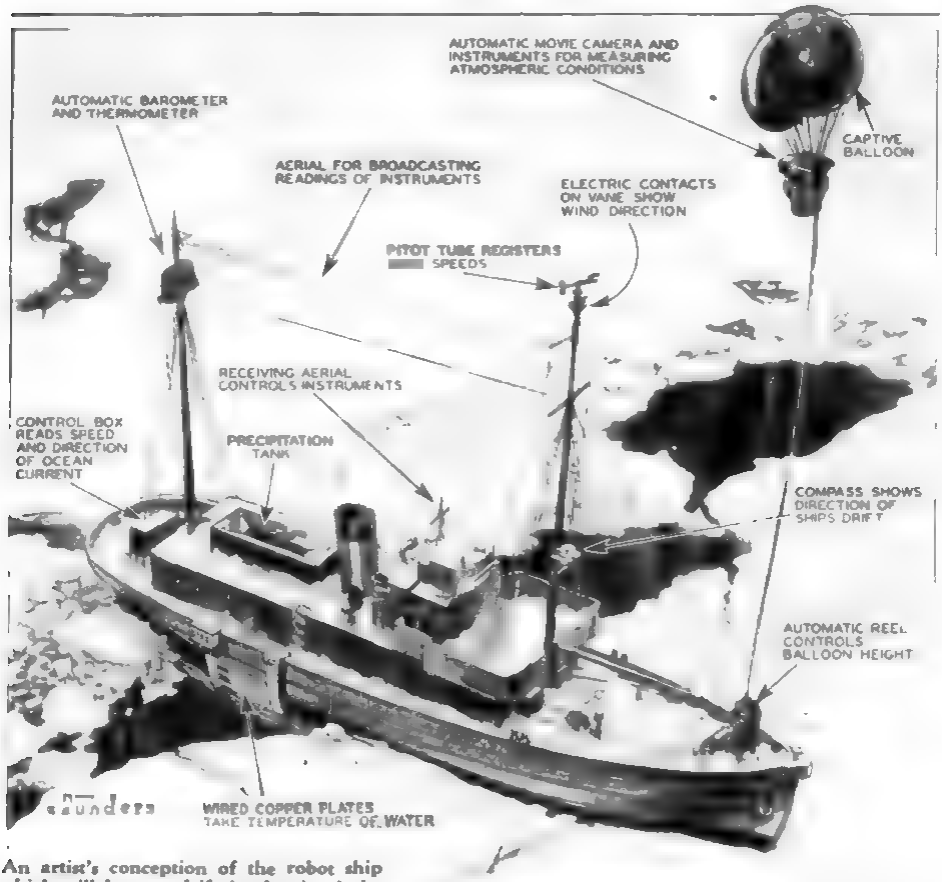
ion of science, explains the folding of the earth's crust and the erection of mountain ranges. The mean density of the earth is 5.5 times that of water, yet the heaviest rocks in the crust, the basalts, have a density of but 3.1. That proves that the central core must be far heavier, and that it probably is iron.

Seismography has proved that this is true. In its present state the earth has a rigidity somewhat greater than that of steel. If the earth were perfectly rigid, and did not yield at all to the tidal pull of the sun and moon, the ocean tides would be higher than they are. On the other hand if the earth were a fluid it would yield so much to the tidal pull that the ocean could yield no more, and hence there would be no tides. The 14-monthly variation in tides and latitude gives another check. If the earth were rigid the period would be but 306 days, and if it were a fluid there would be no variation at all. From these facts scientists have calculated that the dunite shell at a depth of about 30 to 40 kilometers must be about two-thirds as stiff as steel, and the matter 2,900 kilometers down, at the edge of the liquid iron core, must be fully twice as stiff as steel. If the central core was solid, however, the earth would be so stiff it would yield less than the tides and variation of latitude shows it does, so science assumes the iron core is still in a molten state.



This remarkable photo shows a volcanic crater which formed under the eyes of Father Hubbard, exploring in Alaska. The heated crust caved in as the photo was snapped, forming this crater.

Robot Ship to EXPLORE Arctic by Radio



An artist's conception of the robot ship which will be set adrift in the Arctic by Russian scientists to record atmospheric conditions. Wind and water currents and temperatures, barometric pressures, etc., registered on instruments will be broadcast automatically to scientists ashore.

RUSSIAN scientists will next year make the first polar expedition on which nobody needs to go, if plans of Professor P. A. Molshanov of the Aerophysical Observatory at Leningrad, Russia, are put into effect.

A special vessel built strongly enough to withstand any possible ice pressure is to be set adrift next year, the plan is, near Wrangel Island, northwest of Bering Strait. The vessel will be equipped with a complete assortment of weather instruments, astronomical instruments to determine the vessel's position and a robot-like radio sender arranged to read these instruments periodically and to report at regular intervals to receiving stations in Siberia.

It is expected that the vessel will freeze into the ice and drift with it for several years, probably entirely across the Arctic Ocean. Meanwhile Russian scientists working comfortably in their laboratories hundreds of miles away will have radio reports of everything that goes on in the vessel's neighborhood.

Recently Professor Molshanov built the small radio-equipped balloons which were carried on the Arctic cruise of the Graf Zeppelin, and by which readings of temperature, wind, speed and other conditions in the upper air were obtained without need of sending up a human observer. This experience gave Professor Molshanov the idea for an unmanned Arctic expedition.

Electric Eye Opens Doors in All-Mechanical Theatre

Patron passing through turnstile at new Hollywood theatre interrupts beam causing electric eye to operate door mechanism.

WITH the ever advancing stride of progress, Hollywood has kept its place in line. Now it introduces the almost all-mechanical theatre which requires only two people to operate—a projectionist and a ticket seller.

As the patron pays admission to the ticket seller he passes through a turnstile and a door automatically admits him to the inside. This door, shown in the photo at the left, is operated by an electric eye, which sets the opening mechanism to working when the patron interrupts the beam across the doorway.

Another feature of this theatre is the magic drinking fountain that turns itself on when the patron leans over to drink. An electric eye does the stunt.

Why Electric Shocks Cause Death

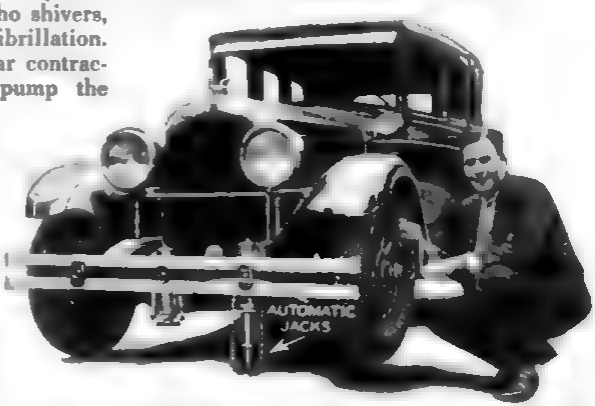
WHY it is that people sometimes are killed by low voltages of electricity, like the 110 volts ordinarily used for house lighting or even by lower voltages, is explained by Professor Horatio B. Williams of Columbia University.

The cause, Dr. Williams reports, is not that this low voltage actually destroys the tissues of the body, as does the much higher voltage used for legal electrocution. What the low voltage does is to shock the heart so that the muscles of that organ begin to quiver continually like a man who shivers, causing what physicians call fibrillation. This prevents the full and regular contractions which are necessary to pump the blood.

If one's skin is dry and the contact with the low voltage wires does not cover a very large skin area, even this heart damage is not likely to occur. The amount of electricity entering the body is too small. Things may be fatally different if the skin is wet, as when a person is in a bath tub, or if there are open cuts or abrasions on the skin which touches the electric wiring.

Automatic Jack Works From Dash

ENRIQUE D. Paez, Jr., of Long Island City, N. Y., has just perfected an automatic jack controlled from the dashboard that saves considerable manual effort when a tire blows out. By simply pulling a lever, in three seconds any one or all of the wheels of the car can be raised. These automatic jacks can be attached to any car in a short time and require little or no care. Each set consists of four units, one for each wheel, as shown in the accompanying photo. Installation requires but little effort.



Controlled by lever from dashboard, this automatic jack raises car wheels without any effort on part of the motorist.

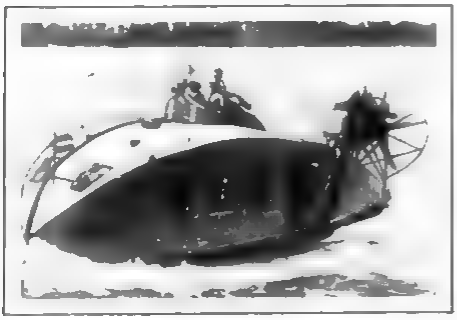
Radio Increases Milk Yield of Cows With Musical Ear

THAT cows will give more milk to the strains of music was proven when Ben Scott, in charge of the cattle at the Fredmar Farms near Oakville, Mo., installed a radio loudspeaker for the benefit of the restless bovines. They immediately showed signs of musical appreciation and stood still while they were milked. Some even cocked a musical ear while the soothing strains of a classical waltz came from the radio.

As an almost conclusive proof to the new idea, the cow pictured boasts of an official record for 3-year-olds with 840.98 pounds butter and 17.864 of milk.

Bossy yields record milk crop listening to boy-friend on radio. She does best under influence of the waltz, it was found.

"River Zepp" Hits 50 m.p.h. Clip



Streamlined and powered by plane motor and prop, this German boat hits a 50 m.p.h. clip.

A NEW propeller gliding ship powered by an airplane motor and prop has recently made its appearance in Germany. Owing to its small draft, it can attain a speed of 50 miles an hour over a clear waterway. It has been dubbed "River Zepp."

Elephants' Brains Due to Trunks

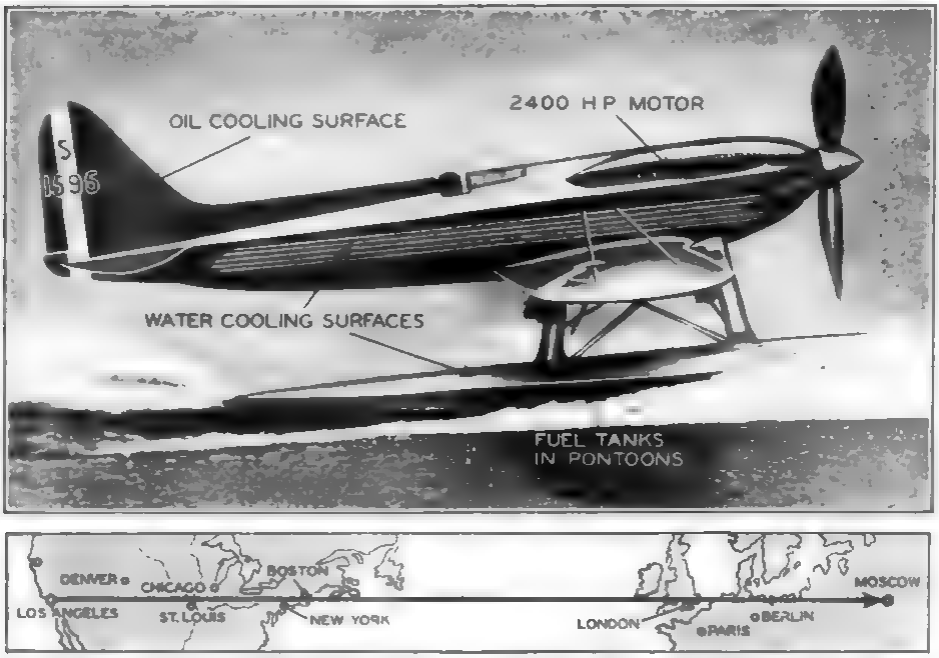
ELEPHANTS are known to have good brains in comparison with other animals. One reason for this, it is suggested by an eminent scientist, is that the elephant has a trunk. Man and the higher apes have done still better for themselves by having two trunks apiece, namely their two hands. Both trunk and hands have aided the development of good brains because these organs make possible examination of objects.

New Glider Popularizes Sport

A DAY of gliders for every one is heralded in the introduction of a new low cost glider by Hans Richter, famous German air man. The new model which he has just designed and tested can be sold for less than fifty dollars and is light enough to be carried easily. No fuselage is used; instead the flier is merely strapped into the framework as shown in the photo below. Unfortunately, this type is barred in this country by the Dept. of Commerce at the present time.

Hans Richter taking off in his low cost glider.

Schneider Trophy RACER



If Lieutenant Stainforth's amazing speed could be maintained for 24 hours he could fly from Los Angeles to Moscow in one day. Above is a photograph of the record-breaking Supermarine seaplane.

DRIVING his Supermarine S-6B seaplane over the triangular course at Calshot, England, Flight Lieutenant J. H. Boothman of the Royal Air Force brought to his country permanent possession of the Schneider trophy and established a new world's record for 350 kilometers (188.6 miles) by averaging better than 340 m.p.h.

Boothman's time would no doubt have been much greater if competition had been furnished for the British team; but with France and Italy withdrawing shortly before the contest date, all the British flier had to do was to fly over the course to capture the third consecutive leg on the coveted trophy.

Boothman kept his seaplane racer under wraps all the way and made wide turns to avoid possible disqualification, but even under these conditions he lowered the previous mark by about eleven miles an hour.

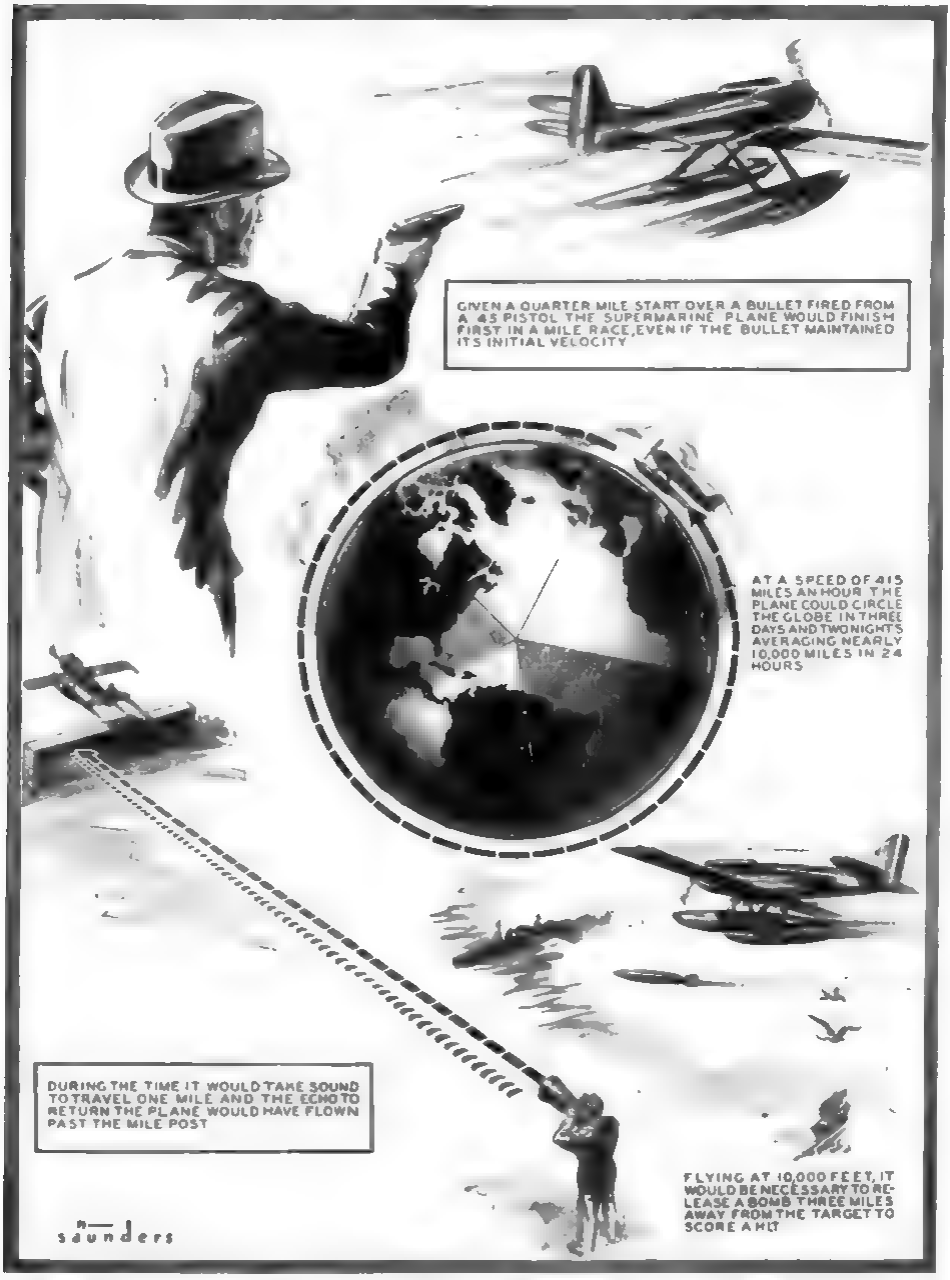
With the Schneider trophy safely won, Lieutenant G. H. Stainforth taxied out in another S-6B for an attack on the world's speed record of 357.7 miles an hour. With a diving start of 1,400 feet he flashed back and forth six times over a 1.8 miles straightaway for an average of 397.05 miles an hour, his fastest lap being flown at 388.67 m.p.h.

Seventeen days later Lieutenant Stainforth again drove his ship over the three kilometer course for four successive laps, the time for each lap being 415.2; 405.1; 409.5 and 405.4, for an average of 408.6 miles an hour.

In a private test, two days before the Schneider classic was run off, Lieutenant Stanislao Bellini of the Italian air force was killed after reaching an unofficial speed of 450 miles an hour.

With the Schneider trophy out of competition a powerful incentive for developing high speed aircraft is removed. Lady Heston, who backed the present British team, has offered to provide a new trophy.

Flies 415 Miles an Hour



It is difficult for most of us to realize just how fast 400 miles an hour really is. Here the artist has shown how the speed of man is rapidly approaching that of bullets and is almost half that of sound.

Motorized Diving Chamber to Seek Sea Bottom Treasure

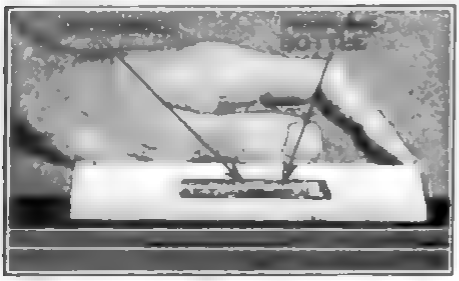
Model of twin-motor diving chamber for ocean exploration.

WITH so much sunken treasure lying around loose and unclaimed on the bottom of the sea, inventors have been stimulated to devise diving contraptions to explore ocean depths on treasure hunting expeditions. The latest diving machine to make its appearance resembles a fantastic sea beast, so strangely is it constructed. Protected with armor plate and thick glass observation ports, the chamber shown in the accompanying photo can descend to a depth of about 350 feet and stay there for as long as seven hours. Communication with mother ship is maintained through telephone equipment. The chamber roams under power of its twin screws.

Pocket Level From Pill Bottle

A SMALL bottle similar to the kind liver pills or perfume comes in may be used to make a level to carry in the overall pocket. The base is a six inch block of wood, tested for level trueness. Cove moulding was used in the level illustrated below. A notch to contain the bottle is routed in exact center of the moulding and filled with plastic wood.

The pill bottle should be filled with colored water allowing just enough of a small bubble to show when held on its side. The bottle is then imbedded in the soft wood and held at true level until the wood sets. Pocket levels of this sort are handy and save carrying the large shop level around on unimportant jobs.



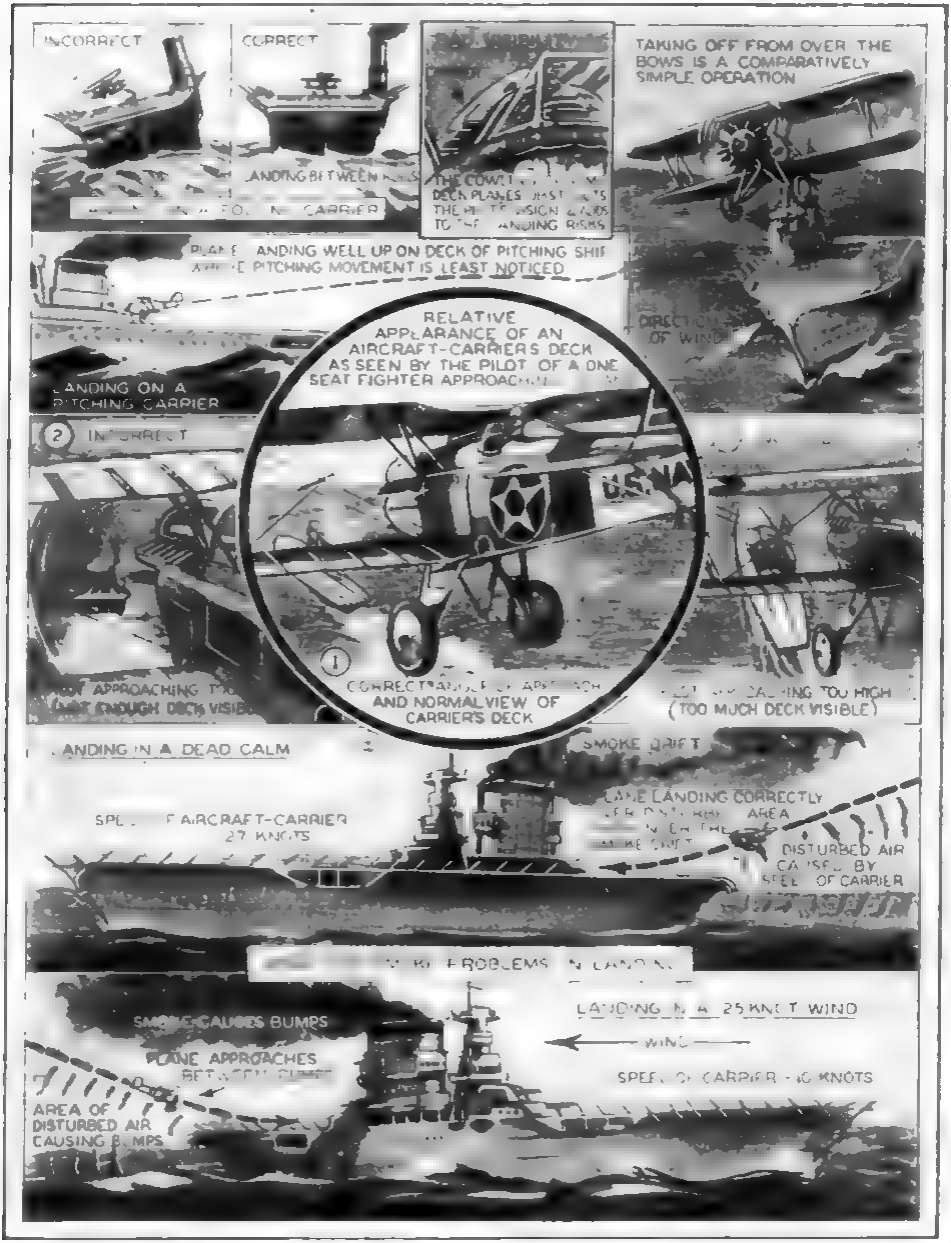
Perfume bottle is mounted on a wood block which has been tested for level trueness. Bottle is filled with colored water allowing small bubble to show.

Auto Kennel for Hunting Dogs

Thomas Nails and James Tufts, of Pinehurst, N. C., standing beside their specially constructed Packard car with its built-in kennels for dogs.

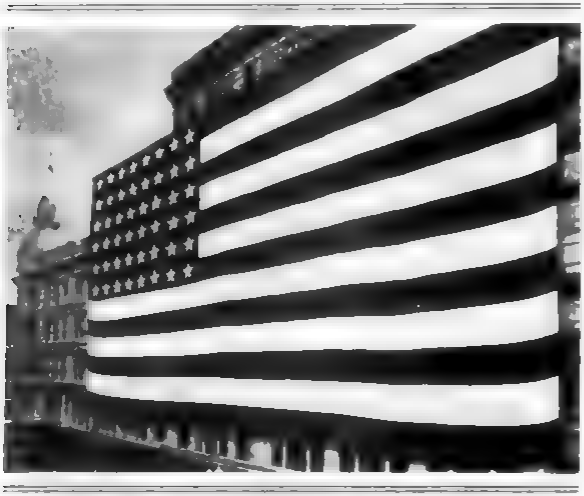
TWO motorist-hunters of Pinehurst, N. C., have solved the problem of carrying their dogs with them on hunting trips afield. This feat they have accomplished by simply arranging built-in kennels beneath the seats of their coupe. The kennel door opens on the side, as shown in the photo above, thus making entrance and exit easy for the hunting dogs. Adequate air circulation for the canines is provided by special vent holes in the door. Although the quarters may be a little cramped, three dogs can be carried with perfect ease. The idea may be applied to almost any make of car with equal convenience for the dogs.

Deck Flying Not so Easy as it Looks



Those who have seen the enormous flight decks of great aircraft carriers have been impressed by their size. But to a naval aviator coming in to land the deck doesn't seem so big. Above are shown the solutions for the many problems these flyers face in landing on and taking off from the pitching and rolling decks. Note how plane is brought in so as to avoid the disturbed air and smoke from the funnels.

Mile of Rope Supports This Block-Long American Flag



Twenty men were needed to hoist this enormous banner.

THE largest American flag in the world, 90 feet wide by 172 feet long and weighing nearly a ton, is shown here as it was displayed on the side of a downtown building in Minneapolis during the recent Knights Templar conclave.

Each stripe is seven feet wide, while each star is six feet high. More than 2,500 yards of wool bunting were used in making the stripes and blue field, and more than 140 yards of muslin were required for the stars.

Using forty miles of thread in its construction, it took thirty people nearly 300 hours of actual sewing time to sew it. Over half a mile of webbing was used to reinforce the flag.

Synthetic Coffee Oil Patented

SYNTHETIC chemistry has scored another triumph with the perfection of a synthetic coffee oil which bears a remarkable resemblance to real coffee in aroma, taste and effect. Many of the substances found in the natural oil have been replaced by analogous substances obtained from other sources. The oil has no harmful effects on nervous system.

Heated Grips for Steering Wheel

A NEW French invention which is attracting considerable favorable attention is a set of electrically-heated leather grips to be used on the steering wheel in winter driving.

Electrically-heated leather grips laced on the steering wheel give comfort in cold weather driving.

Fast Air-Driven Messenger Car

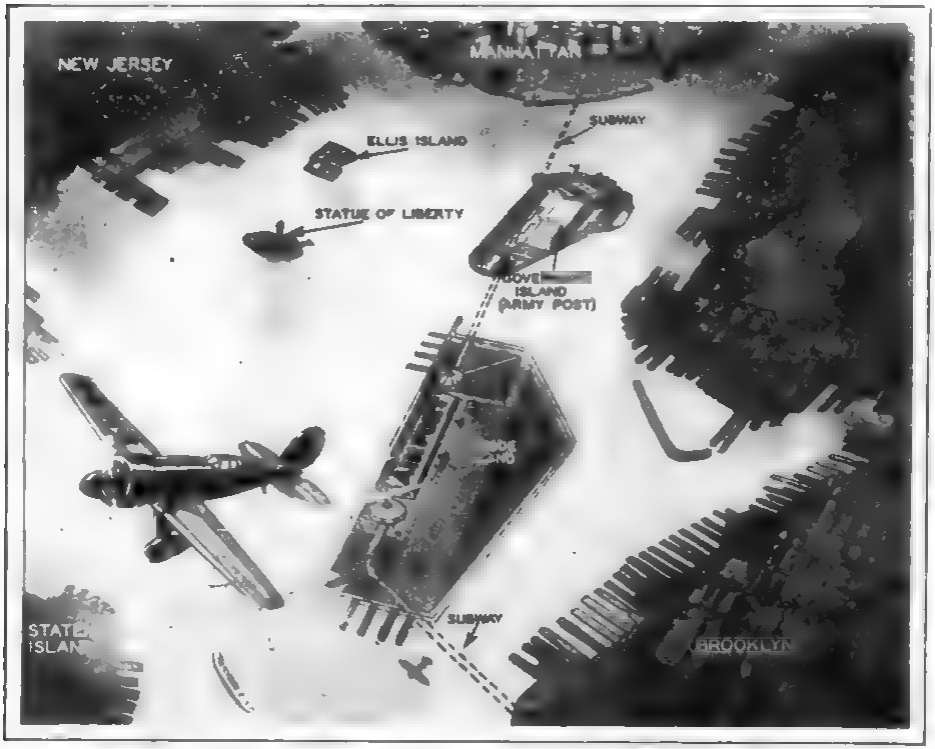
Ruth Elder, noted aviatrix, driving the official messenger car of the National Air Races. The air-driven car is capable of 96 miles an hour.

THE 1931 National Air Races not only revealed some exceptionally fast planes, but demonstrated the possibilities of an air-driven car as a means of getting around the airport rapidly. The official messenger car did 96 m.p.h.

Edison Raps Crude Inventions

"INVENTORS go off half-cocked on too many things," said Thomas A. Edison recently, criticizing American haste in placing on the market too many inventions which have not been thoroughly tested and perfected. His statement was general, and he made no reference to any particular invention.

New York to Build Central Air Port in Bay



This drawing illustrates the construction and location of the centrally located airport now under consideration by the New York Community Council. Covering 800 acres, the air field will have access to Staten Island, Manhattan and Brooklyn by means of traffic tunnels under the bay.

Motorized Sled Speeds 20 M.P.H.

FROM fifteen to twenty miles per hour is the speed attained by a novel motorized sled built by a Maine youth. The motorwheel is held secure by a hinge and operated by a lever arranged on the handle bars.

Leon Lavenaior of Dover-Foxcroft, Maine, riding his twenty miles per hour motorized sled.

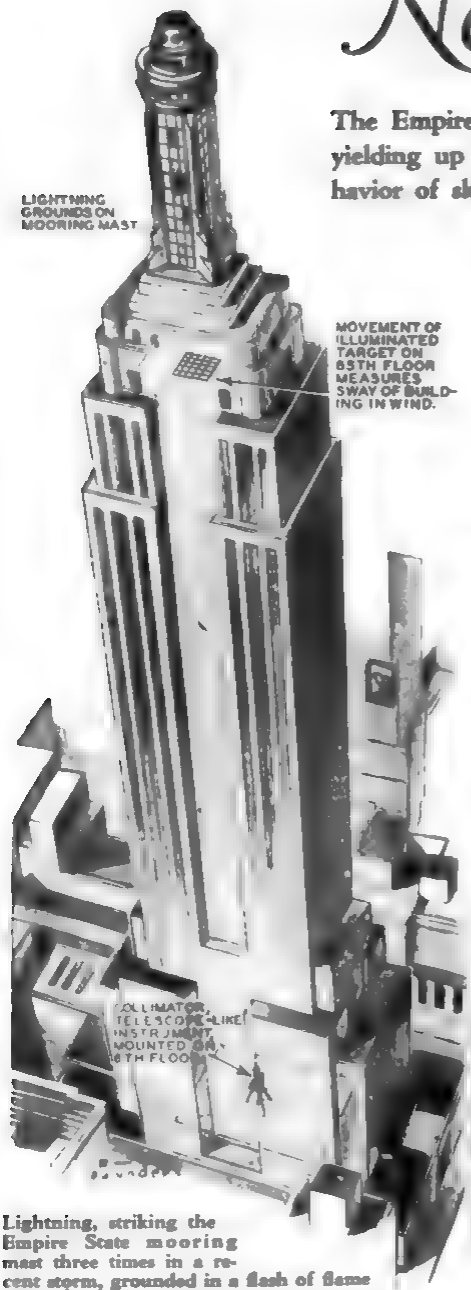
THE city of New York, which has found itself seriously in need of a centrally located air port, is planning to create an island of 800 acres in the upper bay to serve as a convenient flying field. Situated equidistantly between Manhattan, Brooklyn and Staten Island, the island air port will provide quick access to all principal boroughs of New York through three connecting traffic subways as illustrated in the above drawing.

Engineers have pronounced the plan entirely practicable, while aviation authorities state that it would afford the utmost convenience for aerial passengers. The air field would be of greatest service in times of war, providing an easily accessible base of operations during defensive combat.

About 32,000,000 cubic yards of fill will be required in construction, but the material can be easily dredged from the bottom of the bay to eliminate adjacent shoals.

New Facts

The Empire State Building, tallest in the world, is yielding up new facts to scientists studying the behavior of skyscrapers in lightning and wind storms.

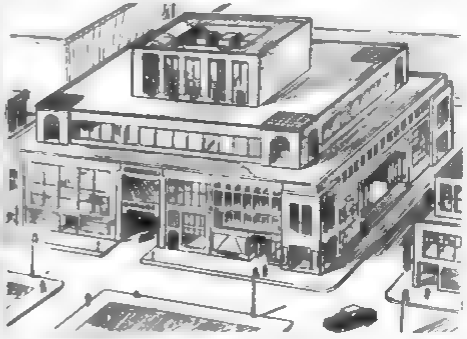


Lightning, striking the Empire State mooring mast three times in a recent storm, grounded in a flash of flame which proved the building to be a huge lightning rod protecting the vicinity. The collimator device, focused on a ruled-off ground glass square at top of building, measures sway in wind.

WHAT is the effect of wind storms and lightning bolts on our giant skyscrapers? What is the reaction of tall buildings to gales which have been known to sweep at 100-mile-an-hour velocities at top story levels? These are some of the questions being studied by government scientists in wind tunnel tests being conducted at the Bureau of Standards with models of the Empire State Building, tallest structure in the world.

As to the effect of lightning bolts, that has already been demonstrated by the building itself. In a recent severe thunderstorm, the metal mooring mast which tops the building, 1,250 feet from the ground, was struck by lightning three times. In all cases the bolt grounded harmlessly in a flash of flame, giving the building the undisputed title of the largest lightning rod in the world. Other nearby structures are protected against lightning by their huge neighbor.

In constructing the building, devices known as pressure outlets were installed on the 36th, 55th, and 75th floors. These are simply small pieces of pipe set flush with the



Architects of the future may do away with skyscrapers, favoring buildings which spread out over four or more city squares as self-contained units, but which do not rise to dizzying heights. Elevator riding is objectionable to many tenants.

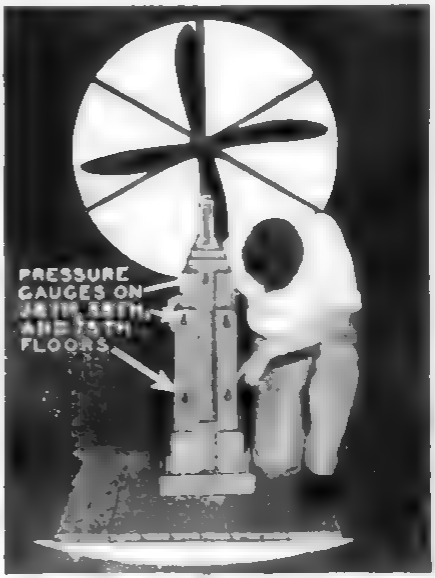
About Skyscrapers

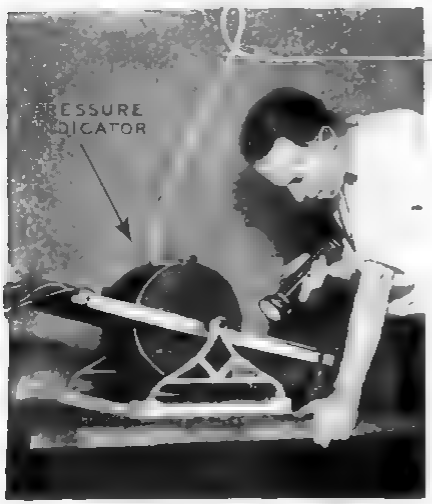
outside wall, through which the wind blows against a column of liquid which registers pressures on a gauge. This is the familiar Pitot tube principle which is used in airplanes to measure air-speed. These give handy readings of wind pressures on the building at all times, and the same principle is being employed in the aluminum model which is being used in tunnel tests.

The question of sway in tall buildings may seem unimportant, considering the fact that rarely is it greater than two inches, but to the office worker seated 1,000 feet in the air, trying to work, a slight sway can easily become annoying, and may even induce an element of unconscious fear in the case of nervous temperaments. That is why skyscraper builders are eager to eliminate sway. Many people are unable to accustom themselves to swift travel in elevators,

which is another factor working against skyscraper popularity.

Col. William A. Starret, whose company erected the Empire State Building, does not





Wind pressures on the Empire State Building model are registered in this drum-like device containing a roll of smoked paper.

Model of the Empire State Building in wind tunnel. Drawing at left above shows method of registering wind pressures at various floors of the building itself.

believe that skyscrapers will go any higher, for a long time, at least. He foresees buildings no higher but much broader than present-day types, spreading out to occupy entire city squares, or even two or four squares.

An instrument known as a collimator is a unique feature of the Empire State Building. This device is essentially a telescope mounted on a tripod in the fire shaft at the sixth floor level. This shaft goes straight up to the 85th floor, where an illuminated target has been placed. The target is crisscrossed with hair-lines at quarter-inch intervals. Any one looking through the collimator can thus tell the number of inches the building is swaying at its top.

MODELS that Have

This $8,000 scale model of a section of New York subway brought a verdict for the defendant involving a sum in excess of one million dollars.

Model making, the pastime of thousands of amateur mechanics, is a lucrative business with many experts. This story tells how verdicts involving millions of dollars or the lives of the defendants have been decided by models which swayed the jury.

VERDICTS involving millions of dollars are handed down each year by American juries because they have been convinced of the allegations pleaded in a lawsuit through the exhibition of scale models. Not only do these objects in miniature play a great part in civil suits, but the fate of many a person charged with murder has been hastened, for better or worse, through the introduction of models.

The model-making business, just as it is applied to making exhibits for courtrooms, is quite a substantial calling nowadays. There are many big firms throughout the country which specialize in this phase of the model-making art alone. They have their own particular clientele of lawyers. Big industries, the utilities and the insurance companies are their best customers.

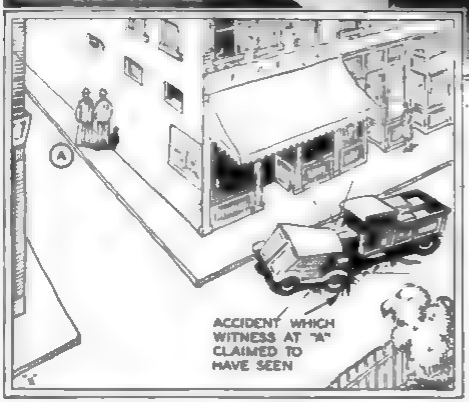
This miniature reproduction of the murder scene sent Ludwig H. Lee to the chair at Sing Sing.

The outstanding case in which a model of a human being was used during a murder trial occurred on Dec. 8, 1928 in the

Helped Justice

by ALFRED ALBELLI

A miniature reproduction of the ill-fated dirigible R-101 was erected in court to aid the officials in their inquiry as to the cause of the disaster.



An entire street was reproduced in miniature to prove that a witness could not have seen the accident which brought on a $50,000 damage suit.

Bronx County courtroom in New York City, where Mrs. Marlyse Maye, a French nurse and war bride, was being tried for the shooting and killing of one Andrew Devola.

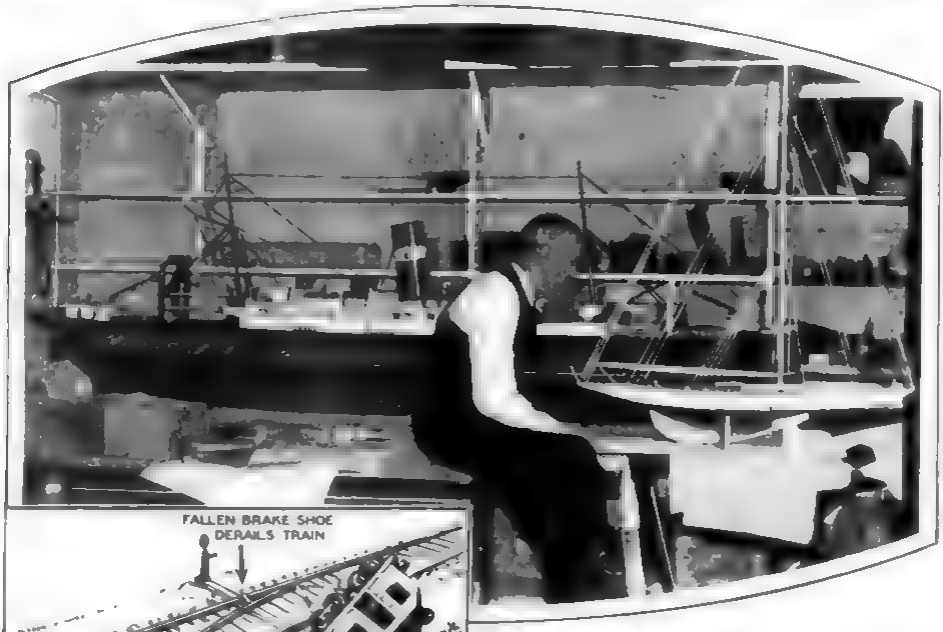
Israel J. P. Adlerman, the resourceful and able district attorney in charge of the prosecution, had secretly requested Medical Examiner Karl S. Kennard to make out a sketch for him of the slain man's wounds. Then the prosecutor obtained a photograph of the victim and a model-maker, also skilled in working with wax, was assigned to reproduce the corpse life-size.

During the tensest moments of the trial, while the woman who was accused of the slaying was on the witness stand, the district attorney signaled for two court attaches to bring the model into the room. It was encased in a box-shaped tarpaulin frame, so that the jury and others might not readily guess what it actually was, and yet feel the horror of the weird sight in the midst of a murder trial.

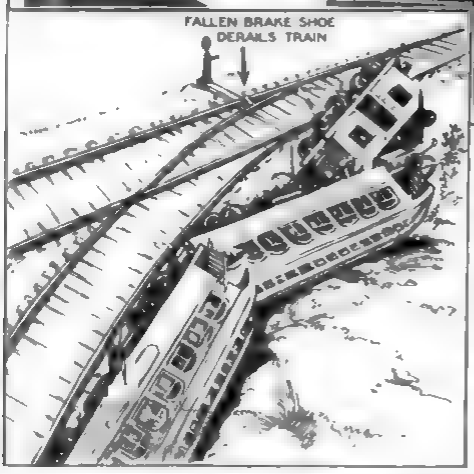
When the covering was ripped away exposing the replica of the murdered man, with red marks to designate where the bullets had entered, and blue marks where they had emerged or reposed, the jurors turned their heads away. Mrs. Maye shrieked and buried her face in her hands.

Although her attorneys argued that this effigy was brought in merely as a "third degree", District Attorney Adlerman insisted that it was to prove that seven shots had been fired into the man's body and that

Train Wreck Reproduced in Miniature Decides Case for Railroad Company



Horace Boucher, perhaps the most famous of model makers, at work on a miniature yacht in his complete model making plant in New York.



An electric train model was so constructed and timed that an exact picture of a railroad disaster was presented to the judge and jury trying the case.

it would have been impossible for him to have committed suicide, as the defense had firmly and convincingly maintained up to this point. Shortly afterward the jury brought in a verdict of guilty of manslaughter. She was sentenced to serve from five to ten years in Auburn prison.

Ludwig H. Lee, who was 40 years old when he went to the electric chair in Sing Sing prison on the night of Aug. 2, 1928, for the murders of two women in Brooklyn, had seen his fate sealed before the jury when the prosecuting attorney introduced a miniature reproduction of the house which was the scene of the slayings.

Edward J. Reilly, celebrated criminal attorney who defended Ludwig Lee, vehemently protested against the appearance of the telltale model in the courtroom, but in vain. The jury was permitted to retrace the events which the state charged against Lee with the guidance of the prosecutor. The twelve good men and true brought back a verdict of "Guilty of murder in the first degree."

Edward M. Grout, eminent New York attorney, and one of the oldest members of the New York Bar, scored one of the most spectacular victories of his career, he recently told me, through the use of models in a court case.

For more than five years he waged battle in the various New York courts in behalf of the Litchfield Construction Company against the City of New York. A decision in favor of his clients in the Supreme Court was reversed by the Appellate Division and finally the case went to the Court of Appeals, tribunal of last resort in the state of New York, where Mr. Grout's triumph

A Lifelike Effigy of the Slain Man Sends Accused Woman to Prison

This stairway was erected in the Supreme Court of New York to demonstrate how Marion Sloane fell down the steps and was injured to the tune of $15,000.

Murder or suicide? This startling wax effigy of the slain man caused the conviction of a woman in New York.

was unanimously recognized by the judges of that court.

The construction company had been granted the contract to construct the Broadway subway lines from 53rd St. to 59th St. The contract was entered into in May, 1915. It called for a completion of the work by July 26, 1917. It was not completed until May, 1919. There was a fine of $600 imposed on the contractor for each day beyond the date set for completion.

Mr. Grout set forth that because of the delay by the engineer in sending through plans, the construction company was compelled to use wood-beams instead of steel in the excavation work. With all these timbers set in to shore up the thoroughfare above, the underground scene looked like a veritable forest.

The situation is best explained in the opinion which the Court of Appeals handed down. It said, "The engineer gave the contractor the first of the working drawings more than thirty days after the contract was delivered and failed to give the contractor the rest of the drawings from time to time as was reasonably and necessarily required.

"Economical method of doing the work required that structural steel should be erected as the excavation progressed. Because such steel was not at that time available, the contractor used a slower and more expensive method.

"War was declared against Germany in April, 1917, at approximately the date set by the contract for the substantial completion of the work. War conditions greatly increased construction costs thereafter. The jury has found that delay on the part of the city's engineer prevented the delivery of structural steel at the time when the excavation was being made, and prevented the completion before the declaration of war."

When Mr. Grout first undertook the action against the City of New York he went to consult Horace Boucher, the famous model-maker. After several hours of con-

(Continued on page 176)

"Artists in Sand" Reproduce Creations of Old Masters

Ross Yost, artist, sculpturing Da Vinci's "Last Supper" in sand.

STONE by no means has a monopoly on the sculpture business, for out at Long Beach, California, sculptors are employing sand, plain beach sand, to duplicate masterpieces. Perhaps the greatest achievement in this line is a greater-than-life-aize reproduction of Leonardo Da Vinci's "Last Supper," shown in the photo at the left, which is the work of Ross Yost, a local artist. This creation attracted wide attention by its magnitude. Other products by these artists in sand depict various historical episodes, such as Washington Crossing the Delaware, and the Spirit of '76.

Primitive Men had Toothache, Too

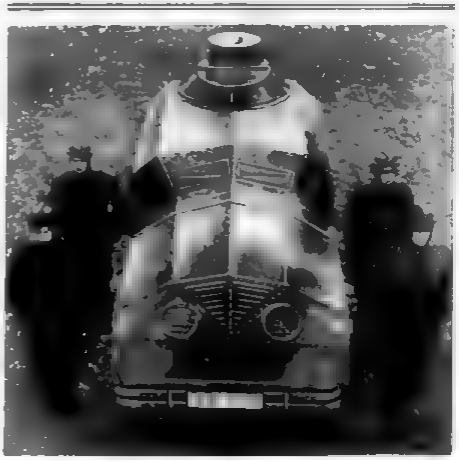
THE common idea that man is losing his wisdom teeth because of soft food was recently disputed by a distinguished anthropologist. A proof that this is no new condition is furnished by the jaws of the ancient human fossil found recently in China which scientists believe represents an extinct species named the "Man of China." The jaws show that its owner had crowded wisdom teeth.

Rollers Prevent False Race Start

TO OVERCOME the bugbear of the speedway, the false start, a new device consisting of stationary rollers on a track has been introduced. The rear wheel of the motorbike revolves on these motors until the starting signal, when the machine is launched to grip the cinders.

To prevent false start, motorbike gets up speed on rollers and shoves off at start signal.

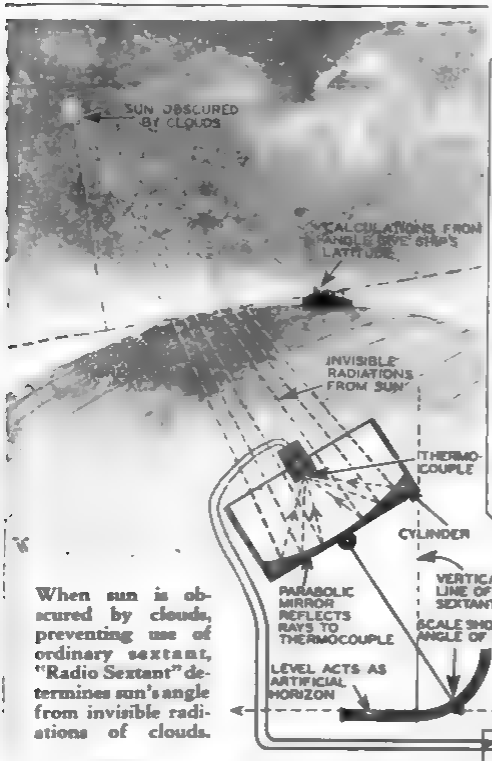
Germany Builds Peace Auto Tank



Built under Versailles Treaty, this new German peace-time tank has heavy duty auto chassis, armor plate covering and small guns. Crew wears special crash helmets to prevent severe head injuries.

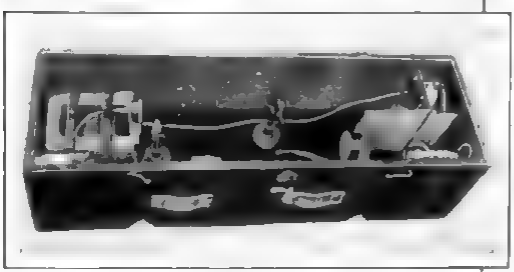
LIMITED by the Versailles treaty to war machines of an inoffensive and somewhat ineffective type, Germany is making the best of the situation by constructing weapons which, while not so formidable, at least inspire terror and provide good training. A special armoured auto has been devised to do duty as a tank, which is prohibited. Shown in the photo above, this automobile has a special heavy-duty chassis, and is surmounted by a turret, swinging a small bore gun.

Radio Sextant Shoots SUN Thru Clouds

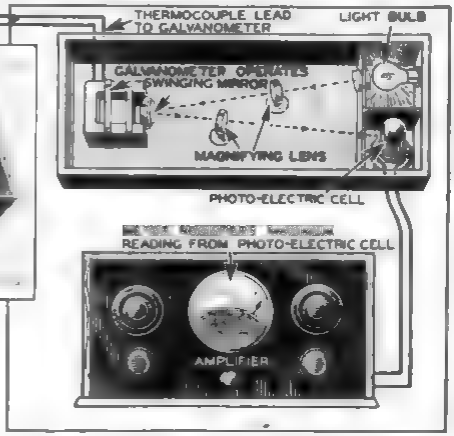


When sun is obscured by clouds, preventing use of ordinary sextant, "Radio Sextant" determines sun's angle from invisible radiations of clouds.

Above photo shows new "Radio Sextant." Parabolic mirror in cylinder reflects rays to thermocouple to show sun's angle, while small level on scale acts as artificial horizon when natural horizon is obscured.



Heart of "Radio Sextant" is this detector, which has sensitive galvanometer operated by thermocouple.

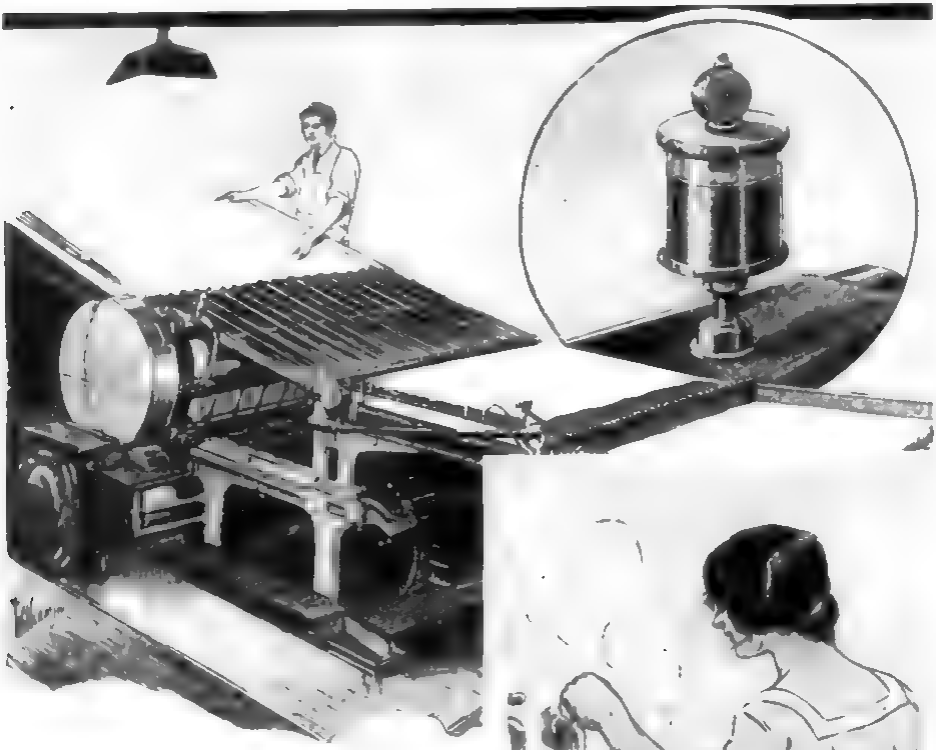


Amplifier with meter operated by the photo-cell.

A SUN obscured by clouds is no longer the bugaboo of sea-faring men, thanks to a new "Radio Sextant," recently perfected, which enables navigators to "shoot the sun" at any time of day, regardless of weather conditions. This instrument, which replaces the old style sextant, detects rays invisible to the eye that emanate from the clouds in a direction parallel with the sun's rays. In preliminary tests at sea it proved remarkably accurate.

When the parabolic mirror is centered on the sun to give scale readings, maximum radiation strikes the thermocouple, operating a galvanometer. A mirror swinging on a pivot reflects light rays into photo-cell, which in turn registers maximum reading on a meter, showing sextant is centered on sun.

Fortune Making Ideas



Printers are badly in need of an invention which will enable static charges to leak off the paper before it is fed to the press. Insert—Inventor who devises a highly efficient oil cup will earn the gratitude of countless bearings, and win a fortune.

1. Eliminate Print Shop Static

ANYONE who knows anything about printing fully understands the difficulty printers have in feeding paper to presses during dry, cold weather. Naturally such weather greatly interferes with production, and some lucky fellow will some day perfect a means of overcoming this annoyance.

I have decided that it might be done by ionizing the atmosphere in the direct neighborhood of the paper to be fed to the press. X-rays, the radiation from radium, and ultra-violet light will render the air conductive but none of these, save possibly the ultra-violet light, could be used for this purpose. The problem is that of permitting the heavy static charges on the paper to leak off in some manner. If the problem is going to be attacked in the manner mentioned, I should suggest preparation by first reading Thompson's classical book called "The Discharge of Electricity 'Through

What we need is a good, leak-proof faucet, say many housewives. Inventors will be wise to devise a faucet that will last for years without attention.

for Inventors

by RAYMOND F. YATES

How to Get Help on Developing Your Inventions

Fortunes await the inventors who will develop the ideas which Mr. Yates sets forth in this department. Manufacturers are calling for the new inventions and will reward you richly for solving their problems. Mr. Yates, who conducts this department, is well qualified to give sound, practical advice on questions of scientific, patent and law procedure, and will gladly assist Modern Mechanics readers along these lines. Address your questions to Raymond F. Yates, care of Modern Mechanics and Inventions, enclosing a stamped and self-addressed envelope.

A machine that will remove the shine from trousers by cutting a new nap in the fabric is in great demand by tailors. Such a machine could be sold to every tailoring and pressing establishment.

Electrical manufacturers will pay the inventor a handsome reward who will devise a flexible connection that won't wear out or shock the fingers when handled.

Gases". There might be a clue in this book that would enable a clever inventor to solve a problem.

Specifications: The invention should be able to discharge the paper before or as it is being handled for printing. It should be a simple device so that its cost will be low. The principle involved should also be capable of being applied to presses using roll paper and in which high static charges often give trouble.

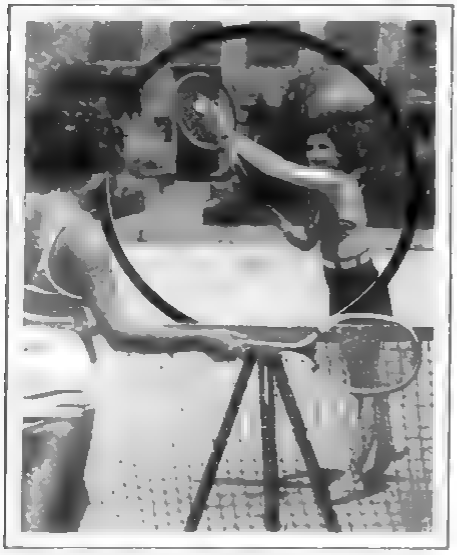
Exploitation: Should be patented in the leading foreign countries and the machines should be rented to printers by the year, never sold. To do this, the inventor should interest some manufacturer who would be willing to enter into some sort of an agreement that would make such procedure possible.

2. Can YOU Invent a Grease Cup?

WE HAVE electric refrigerators, television and the highly abstruse quantum theory, but we have no thoroughly efficient grease cups. We have yet to invent a cup that will really perform efficiently and I, for one, would like to be the lucky fel-

(Continued on page 184)

Players Drive Ball Through Hoop in New Tennis Game



Players score by knocking ball through the hoop.

"HOOP TENNIS", the latest fad to hit Hollywood, introduces an entirely new angle in the tennis game. The idea in the new game is to smack the ball through a large hoop from any angle of the court. If the ball doesn't go through the hoop, the stroke doesn't count and you don't win any cigars.

No Skidding on Metal Streets

THE latest step toward prevention of accidents on heavily traveled thoroughfares is represented in the development by English engineers of a non-skid road. Surfaced with studded metal which eliminates all danger of slipping in wet weather, the road affords far better traction than the customary concrete or asphalt surface. Durability is also augmented, since a layer of concrete underneath the metal gives a solid base.

In the photograph below, Mr. Frank Hough, chairman of Henley's, Ltd., who was responsible for the development of the new type of road, is seen with the first car to be driven over the street.

Danger of skidding is eliminated on this new street surfaced with studded metal plates.

Harvest to Bread in One Machine

A MACHINE called the "Autopane", or self-bread maker, has been invented to convert harvested grain directly into bread without making flour or carrying out any of the complicated processes of bread-making.

Rubbers for Golfing in Dew

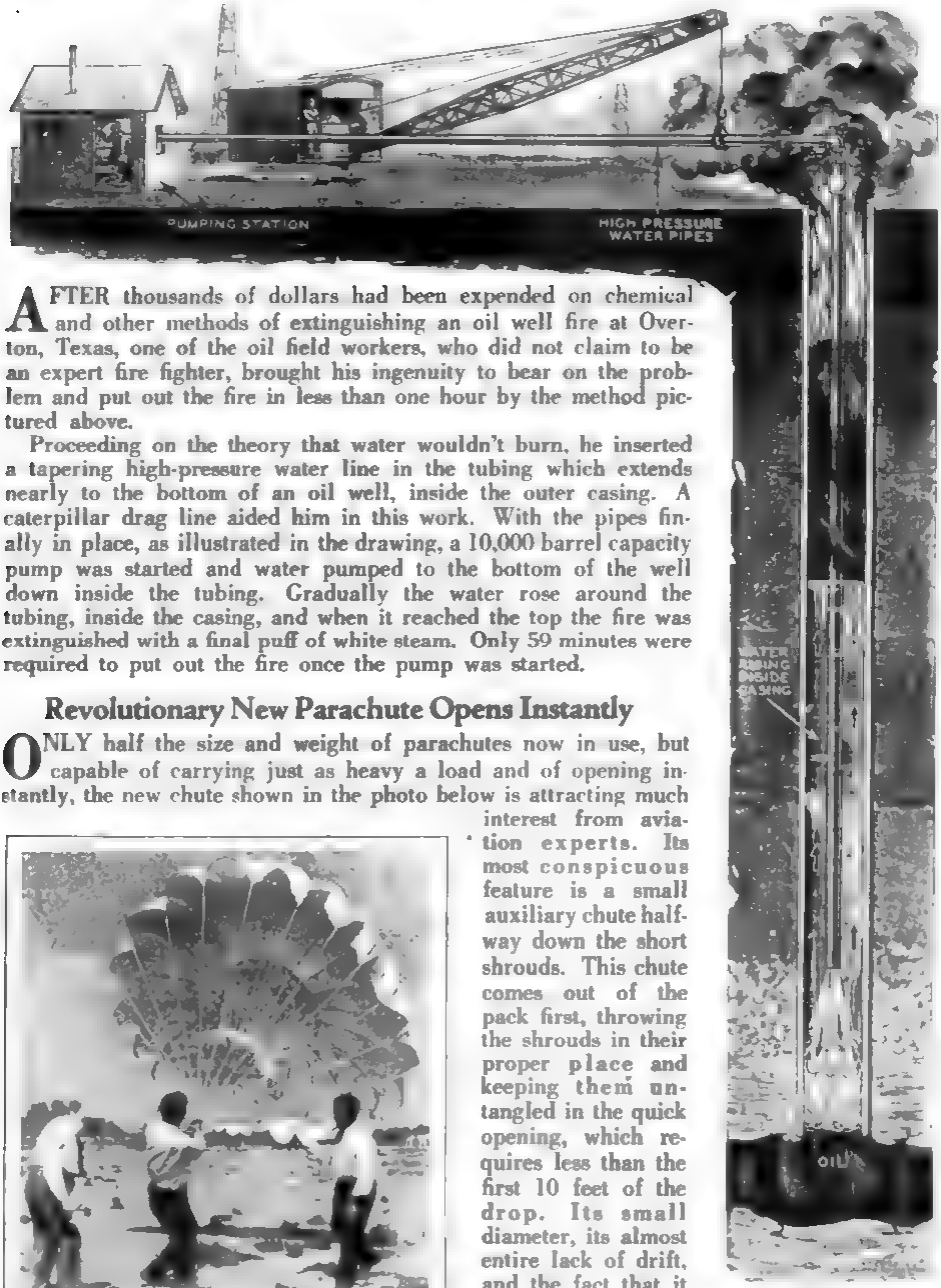
Spiked rubbers, as shown, fit over regular golfer's shoe.

GOLFERS who are addicted to playing a couple of rounds in the early morning before the dew is off the grass will welcome a new type of rubbers which has been developed. Worn over a pair of thin sole shoes, their weight is about equal to weight of a pair of golf brogues. In the soles are embedded a number of metal spikes that prevent slipping.

Cigarettes Prevent Forest Fires

DANGER of forest fires from smoldering cigarettes may be eliminated by the development of a new process of tobacco manufacture. The tobacco is treated in such a manner that the butt goes out soon after being discarded.

Blazing Oil Well Extinguished With Water



AFTER thousands of dollars had been expended on chemical and other methods of extinguishing an oil well fire at Overton, Texas, one of the oil field workers, who did not claim to be an expert fire fighter, brought his ingenuity to bear on the problem and put out the fire in less than one hour by the method pictured above.

Proceeding on the theory that water wouldn't burn, he inserted a tapering high-pressure water line in the tubing which extends nearly to the bottom of an oil well, inside the outer casing. A caterpillar drag line aided him in this work. With the pipes finally in place, as illustrated in the drawing, a 10,000 barrel capacity pump was started and water pumped to the bottom of the well down inside the tubing. Gradually the water rose around the tubing, inside the casing, and when it reached the top the fire was extinguished with a final puff of white steam. Only 59 minutes were required to put out the fire once the pump was started.

Water forced into a burning oil well extinguished it in one hour.

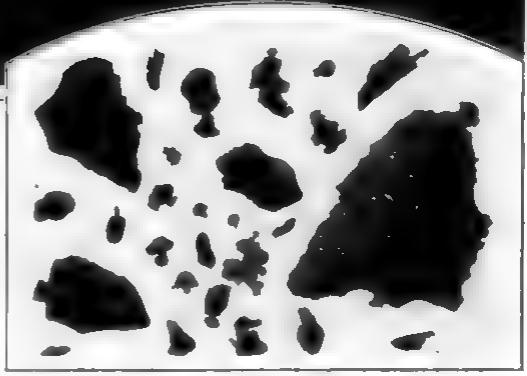
Revolutionary New Parachute Opens Instantly

ONLY half the size and weight of parachutes now in use, but capable of carrying just as heavy a load and of opening instantly, the new chute shown in the photo below is attracting much interest from aviation experts. Its most conspicuous feature is a small auxiliary chute halfway down the short shrouds. This chute comes out of the pack first, throwing the shrouds in their proper place and keeping them untangled in the quick opening, which requires less than the first 10 feet of the drop. Its small diameter, its almost entire lack of drift, and the fact that it has little drag after landing, are other points of interest.

This parachute will open in less than 10 feet.

Fiery VISITORS from

One of the most remarkable photos ever taken of a meteor. A Minnesota photographer, taking a night picture of his home, caught the streaking meteor on his plate as it flashed past without warning. Later on its course the missile barely missed an airplane in flight.



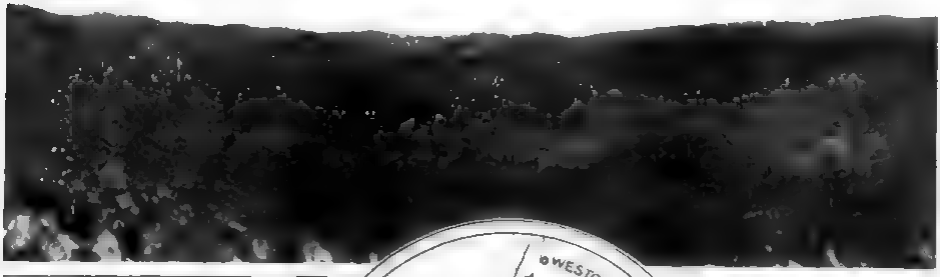
Highly magnified particles of meteor dust. Meteors do not "burn up," but are reduced to powder by friction.

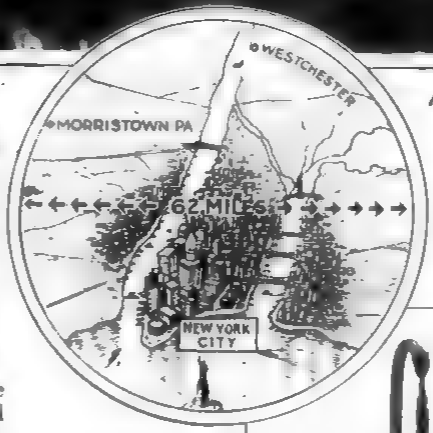
MARK TWAIN'S immortal remark about the rumors of his death applies to a good many reports of meteor falls and the damage alleged to have been done by them. The authorities are skeptical about the huge meteorite stated in press despatches to have buried itself in the ground near Malinta, Ohio, on June 10, of this year, and the hole made in Lawrence Swank's automobile near Crawfordsville, Indiana, October 10, 1930, after having figured in the pictorial news of the world as the work of a meteorite, was pronounced to have been due to missiles from a mere shotgun.

But meteorites do sometimes fall, and they have been known to cause damage. Moreover, their *potential* destructiveness is almost unlimited. A few months ago a meteorite of iron and nickel, 14 feet in length and weighing between 70 and 80 tons, was found in the Tanganyika region of Africa by a British surveyor. An object of such size, if it fell in a suitable locality, could, of course, wreck a large building or kill several people; and although this African meteorite is the biggest thus far actually discovered, it is certainly by no means the biggest one that has ever fallen.

Unknown Worlds

by CALVIN FRAZER





Above — Meteor crater, Arizona, scooped out by a gigantic meteorite. At left—Area which would have been wiped out had the giant meteorite which landed in Siberia in 1908 struck New York City area.

Undoubtedly a vastly larger meteorite—or perhaps a huge shower of such bodies—fell on June 30, 1908, in a sparsely inhabited forest region of Yenesei Province, Siberia. The fall was seen and heard at places hundreds of miles away, and the air waves produced by it were registered by barographs in England and America. Several square miles of forest were wiped out, a herd of 1,500 reindeer was destroyed and some buildings were damaged by the air blast in the surrounding country. The details of this spectacular event remained unknown to the world at large until twenty years later, when a Russian scientific expedition visited the scene and found ample evidence of what had occurred.

If it had happened in a different place, this meteor fall might have been one of the most colossal disasters in history. If the meteoric mass, in its flight through space, had hit the earth six hours later, the earth's rotation would have placed southern Norway or Sweden in its path, so that some good-sized town might have been destroyed. If the fall had happened about eleven hours later and about 20 degrees of latitude farther south, the city of New York might have been annihilated, with a loss of millions of lives and billions of dollars' worth of property.

Other meteor falls of equal magnitude have certainly occurred, though not, so far as known, in modern times. In the desert of northeastern Arizona, about two miles east of Canyon Diablo, may be seen an enormous hole in the ground—a circular depression about 4,000 feet in diameter and about 600 feet deep. This well-known formation, called

Museum specimens of meteorites, the upper one suspended by a chain through a natural cavity in its center. Meteors are "falling stars" which are destroyed before reaching the ground; meteorites reach the earth.

This meteorite, which fell in Chile, is one of the largest known. Meteors in space travel at a speed of about 26 miles a second, which explains why they flame instantly into white heat when they strike the earth's atmosphere.

Digging for a meteorite which fell in Wisconsin. Meteorites are distinguished from other rocks by the fact that a magnet attracts them.

Meteor Crater, is supposed to be the result of a fall of meteoric material even greater than the one that occurred in Siberia. Thousands of small iron meteorites have been found near the crater and a much larger mass of such material is believed to be buried in the ground, though efforts to locate it by means of borings have not yet proved successful. Traditions of the fall are preserved among the Indians and it may have happened not more than 2,000 years ago. Within the last few years a number of other crater-like formations, plausibly attributed to great meteor falls, have been discovered in various parts of the world.

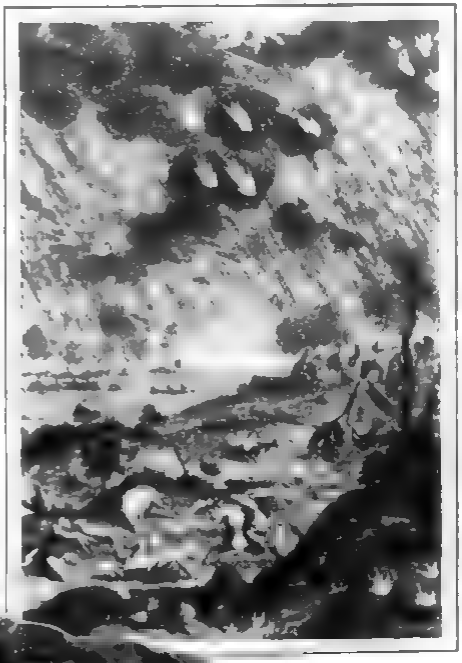
While these evidences of big falls show that a great disaster might easily be caused by meteorites, the fall of a single small meteorite would suffice to kill or seriously injure a human being. Such accidents are, however, excessively rare. The recorded cases are mostly so old that it is impossible to form a definite opinion of their authenticity. The stories in the Bible of the destruction of Sodom and Gomorrah by a rain of fire and of the armies that fought against Gibeon by "great stones from heaven" have been supposed by some biblical scholars to refer to meteor showers. A monk is said to have been killed by a meteorite at Crema, Italy, in 1511, and another monk to have perished in this manner at Milan in 1650. Two Swedish sailors are alleged to have been killed on shipboard by a meteorite in 1674.

Reports of such occurrence in modern times have usually proved, on investigation, to be unfounded. Three years ago a child in Japan was struck and slightly injured by a

small hot stone, which was examined immediately after the event by competent authorities and pronounced to be a meteorite. In other cases of modern occurrence people have had narrow escapes from death or injury. Thus in 1847 an iron meteorite weighing nearly 40 pounds fell through the roof of a house at Braunau, Bohemia, into a room where three children were sleeping, covering them with debris but doing them no serious harm. There are several other undoubted cases of meteorites falling into buildings.

Danger from meteorites therefore exists, but it is so slight that nobody need lose a minute's sleep over it. Some reassuring figures on the subject were published not long ago by Prof. C. C. Wylie, of the University of Iowa. From an analysis of all known finds of meteorites in this country he concludes that in the whole of the United States a meteorite may be expected to hit a human being only once in 9,300 years, on an average. The chance of any particular person being hit is therefore almost infinitesimal.

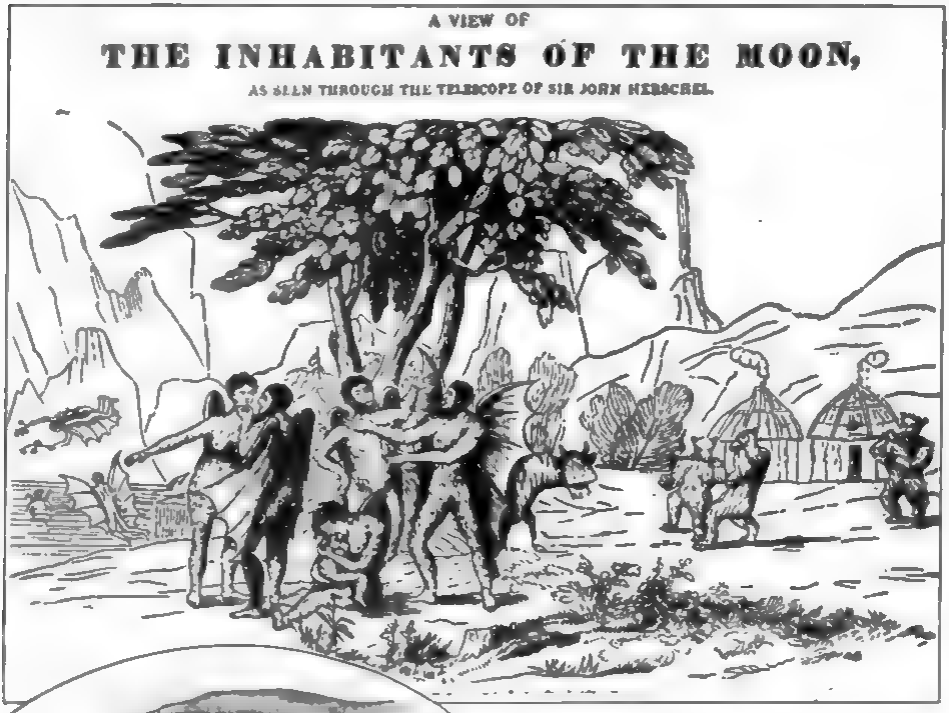
The danger would be enormously greater if the earth had no atmosphere. According to W. F. Denning, the great English authority on meteors, who died last June, more than 20,000,000 meteors big enough to become visible to the naked eye when they light up, on account of heating by friction in their swift flight through the air, enter the earth's atmosphere from outer space every 24 hours. Smaller meteors, visible only in the telescope, are vastly more numerous; some estimates running as high as 3,000,000,000 a day. Both the naked eye and the telescopic meteors are, with few exceptions, very small bodies—many smaller than a grain of sand and few bigger than a boy's marble—but they travel, before reaching the atmosphere, at the enormous speed of about 26 miles a second.



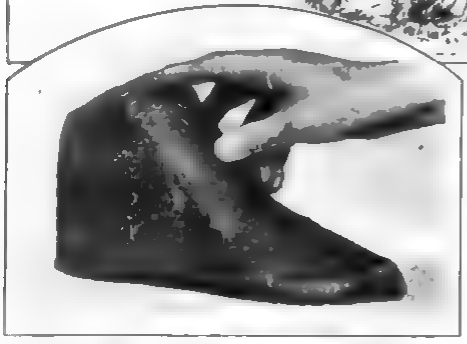
Biblical "rains of fire" may have been meteors.

The famous Willamette, Oregon, meteorite in the American Museum of Natural History, New York. The cavities are due to the rusting away of iron while the mass lay for some time in damp ground.

Scientific Hoaxes that



This drawing was published in connection with the great moon hoax, in which Sir John Herschel was said to have discovered a strange people inhabiting the moon who had wings like bats.



A water-worn stone was once offered to the Smithsonian Institute as a petrified foot. Note the striking resemblance.

A FEW years ago the learned world was startled to hear of the discovery near the hamlet of Glozel, France, of a quantity of baked-clay tablets inscribed with the letters of an unknown alphabet, pronounced by some authorities to be the most ancient specimens of writing thus far brought to light. These and other objects supposed to have been found with them were the subject of a prolonged controversy among archæologists, but an international commission of experts appointed by the French government finally pronounced them to be forgeries. Thus the Glozel affair took its place among the most famous hoaxes of all time.

The list of remarkable fakes and hoaxes is a long one. Some of these deceptions are much more familiar than others. The Keely motor and the Moon Hoax are known, at least by name, to most Americans, and Dr. Cook's alleged discovery of the north pole will doubtless go down in our history along with the better authenticated achievement of Peary. Other exploits in hoodwinking the public that attracted a great deal of attention in their time are now almost forgotten.

In August, 1815, when news had just been received of Napoleon's impending exile to St.

Have Fooled the World

The Cardiff giant, shown above, was one of the most famous fakes in American history. This supposedly petrified man was exhibited in many large cities and stirred up much scientific controversy.

Some of the "Wurzburg fossils" that made a great stir in the 18th century. They were faked by University students as a joke on their professor, who later published a book about them.

Helena, some wag conceived the idea of distributing handbills in the English town of Chester, stating that the island chosen for the ex-emperor's retreat was dreadfully infested with rats, and that the government had decided to clean them out. The advertisement offered liberal prices for cats and kittens to be used for this purpose. These were to be delivered at a specified address, which turned out to be a vacant house, and to which more than three thousand felines were brought on the appointed day.

A much more sensational hoax was one perpetrated on November 9, 1874, when the New York *Herald* published a full-page article, under a "scare head", describing the escape on the previous afternoon, a Sunday, of most of the wild animals in the Central Park Zoo. Hundreds of people were said to have been killed or mangled by lions, tigers,

(Continued on page 172)

The fake Indian mummy, exhibited in American cities in 1894, compared with a man of average height. The fraud was exposed by Dr. F. A. Lucas, who purchased the mummy from a southern pawnshop. He found it to be composed mainly of gunny sacking and metal scrape. It was supposed to have been discovered in a California cave.

Acquiring Skill

Springing the cards from one hand to the other is very difficult if the cards are not held right.

"They laughed when I sat down to deal —but from the first shuffle I held them spellbound." You too can amaze your bridge or poker friends with these simple card stunts which are easy to learn.

IT PAYS to do things differently, even in Hollywood. One day, recently, a well known picture star paused at a table where bridge was being played. A young man was dealing the pasteboards, but instead of shuffling and cutting the cards in the Hoyle manner he made a number of cuts with one hand and dealt in a different manner that aroused the admiration of onlookers. The following day he was hired to perform before the camera and the resulting strip of film was dubbed in on a poker scene for the star's current picture.

Fig. 1. How to spring the cards. Held in the right hand, the thumb at one end of the deck and the fingers at the other, the deck is squeezed and the pressure gradually released.

It is not difficult to acquire skill with cards. Half the practice time used in learning to play the ukelele will enable anyone with normal hands to perform flourishes that look impossible to the uninitiated. The whole secret is practice and the perfection of each movement before starting on the next. Over a bed is a good place for ten minutes a day practice; it saves backache from picking up the cards during first attempts. After that it is easy.

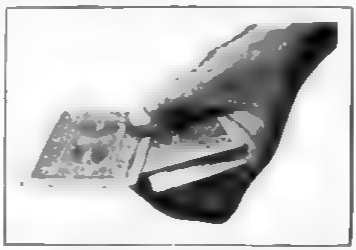


Fig. 2. This shows how to deal with one hand. The thumb slides the card off the top and goes back for another.

Follow the photographs and instructions with a deck of cards in the hands.

with CARDS

by KENNETH MURRAY

Fig. 3. The one-handed cut is decidedly novel when done in any card game. The pack is first held in the left hand between the thumb and fingers.

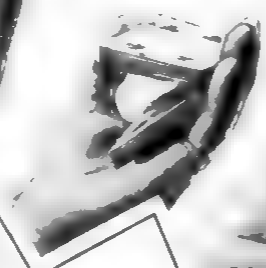


Fig. 4. Loosen the pressure on the lower part of the thumb slightly and allow the lower half of the pack to fall into the palm of the hand as shown here.

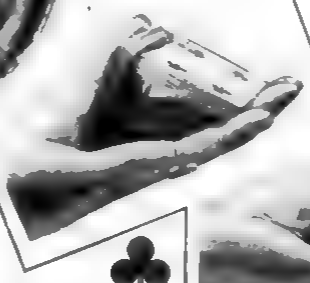


Fig. 5. Now with the first finger raise the lower half until it drops over the top half.

Fig. 6. Here is the completed cut ready to hand to the dealer. The action of the first finger in raising the lower half of the deck is shown below in Fig. 9.

Small hands can manipulate a bridge deck more easily than cards of standard size. The cards should be well broken in by previous use; neither brand new and "slick", nor so old that they are dog eared and clumsy.

The one-handed cut, decidedly novel when done during any card game, consists in holding the deck in the left hand as shown in figure 3. Loosen the pressure of the thumb slightly and allow the lower half of the pack to fall into the palm (figure 4). Now with the first finger raise the farther side of the lower half (figure 5) until it drops on top of the top half (figure 6). The action of the first finger in raising the lower half is illustrated in figure 9, with the hand shown from the opposite side.

That is all that there is to it. Seeming clumsy at first, soon the fingers limber up and the movement becomes one of habit so that the cut is made in an instant, without fumbling. When the one cut has been mastered, try cutting the cards twice and more in the one hand, with one movement. This is a little more difficult but with practice the author does not find it difficult to make seven, eight and more cuts at one time, which thoroughly mixes the cards and arouses the admiration of any bridge fiend.

Figures 7 and 8 show the movements. The cards are held as in figure 3 and most of the pack is dropped into the palm, the thumb holding back only five or six

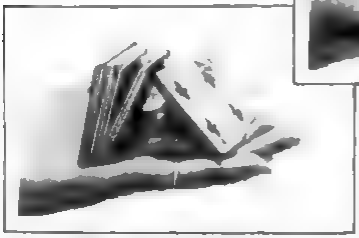


Fig. 7. When one cut is mastered try cutting the cards twice and more.

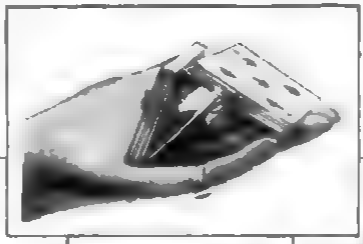


Fig. 8. The multiple cut is started as before, but most of the pack is dropped, then raised with the finger and held with the thumb, allowing a few cards to drop back into the palm.

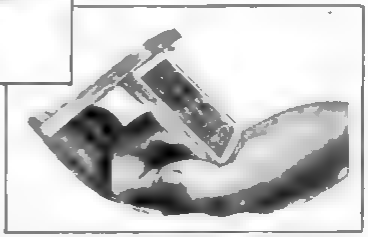


Fig. 9. This photo shows the action of the first finger in making the cuts.

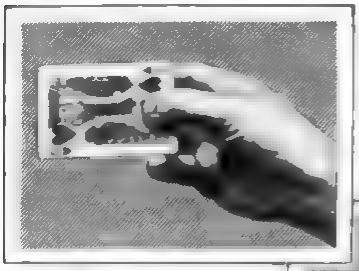


Fig. 10. The first step in back and front palming. When a card is dropped from the table, pick it up with the right hand and hold it in this position. It is then easy for you to cause it to disappear.

Fig. 11. The first and little fingers grasp the card, and the two middle fingers force it around the back of the hand as shown.

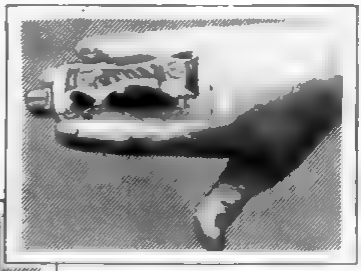


Fig. 12. The final step in back and front palming. The card is held on the back of the hand while clipped between the fingers. In showing the other side turn it over with a twisting movement.

cards. After the first finger has raised the lower half it is grasped by the thumb, this time on the left hand side of the pack. Allow a few cards to fall back into the palm, and with the fingers shove the original top cards into the opening. Then raise that part of the pack again with the first finger and repeat with as many cuts as possible. By dropping off as few cards as possible at each cut the larger will be the number of cuts that can be made.

When a card is dropped from the table, pick it up in the right hand and cause it to disappear, showing the hand empty back and front. This is a stunt called "back and front palming". The original position for holding the card, at the finger tips, is shown in figure 10.

The first and little fingers grasp the card, and the two middle fingers force it around to the back of the hand (figure 11) so that it rests, clipped between the fingers, as in figure 12.

In showing the other side of the hand, turn it over with a twisting motion, at the same time reversing the movement. This is aided by drawing in the two middle fingers to force the card into the palm, which is by that time turned from spectators. In again showing the front of the hand, the thumb pushes the card back into the place. The movement can be repeated continuously, and after some practice a number of cards can be handled at one time.

Springing the cards from one hand to the other is found impossible to most people, mainly because they do not hold the cards in the correct position. Held in the right hand, the thumb at one end of the deck and fingers at the other, the deck is squeezed to bend in towards the palm (figure 1).

The fingers and thumb then gradually release pressure and force the cards, one at a time, from the right hand. They will spring into the other hand, held underneath, in an even cascade. At first practice with the left hand held only a few inches underneath the right; later, the distance can be increased up to several feet. The hands are brought together with a snap when most of the cards have passed.

One handed dealing is different and quite easy. Figure 2 shows how. With the deck held in one hand, the thumb slides a card off the top and it is thrown to the card table with a jerking movement. As soon as one card leaves, the next is shoved off, and with very little practice it is possible to deal a deck in half of the usual time.

A stunt that provokes amusement is to touch the first finger to the top of the deck a number of times; finally a card is seen to leave the pack as if glued to the first finger. Figure 13 shows the effect, and figure 14 the method. The little finger, used to push up the back card, is concealed behind the cards. Of course the deck always faces the spectators.

The "Niagara Falls" shuffle is very pretty. The cards are given a shuffle as in figure 17 by releasing the corners of each half of the pack so that they snap into

"mesh" in the customary manner. Instead of shoving them together, however, the ends are grasped in the palms of the hands and given a curve the shape of a bridge (figure 18) when they will fall to the table in pleasing rotation with accompanying noise like a small waterfall.

Illustrations 15 and 16 show a novel stunt in which the cards turn over when spread out on the arm. Grasp the cards between thumb and fingers, at the ends, squeezing them so that the bottom is concave. Starting at the tips of the fingers of the extended arm release the cards as in springing them from hand to hand, at the same time drawing the deck towards the elbow.

Now raise the bottom card with the fingers of the hand holding them and raise it until all of the cards do a "flip over." Lower the arm and they will all slide down into the hand, ready to repeat the stunt or start on another.

Many fascinating tricks require as a preliminary what is known as the "spread." In this stunt the performer simply spreads the cards out like a fan over the table. It looks simple, but there's where you're fooled, for considerable skill is required.

First take the cards in the hand as illustrated in Figure 3. Then place the deck face down or face up, as the case may be, on the table, and draw the deck around in a semicircle. The fore finger should be held down close to the table along the side opposite the direction of movement. Now when just the correct pressure is applied to the top of the deck, there will be left an evenly-spaced fan-shaped stream of cards across the table. A little practice at this trick will make perfect and you can work the stunt with some trick involving a selection of cards.

In performing all tricks it is advisable to employ cards that are slightly worn from use. New, shiny cards slip around too easily, making it difficult to get a secure grip on them with the manipulating fingers.

It must be remembered that the various flourishes are not merely "tricks" but require skill obtained only by practice. In this there is a great advantage. The average person, shown the secret of an ordinary card trick, can immediately do it himself. Not so the flourishes requiring skill. Skill with cards can be developed in the same manner as learning to play a musical instrument, that is, by practice, and the amusement derived is fully as great.

Figs. 15-16. In turning the cards over on the arm, grasp the deck at the ends between the thumb and fingers, squeezing them so that the bottom is concave. Then spring the cards, drawing the deck toward the elbow. Now raise the bottom cards with the fingers, flip them over and lower the hand sharply.

Figs. 13-14. With the deck facing the spectators, touch the first finger to the top of the pack a number of times and then push up the back card with the little finger as shown.

Figs. 17-18. Shuffle the cards as shown at the top photo, but instead of shoving them together, grasp the ends in the palms and curve them upwards. They will fall to the table in pleasing rotation.

Lighter-Than-Air Flying Wing for Stratosphere Flight

Henry A. Nicholson of Los Angeles demonstrating a model of his lighter-than-air flying wing.

A STRANGE new type of airship, described by its inventor as a lighter-than-air flying wing, has been designed by Henry A. Nicholson of Los Angeles, and a model of the ship, shown at the left, has been put on display in that city.

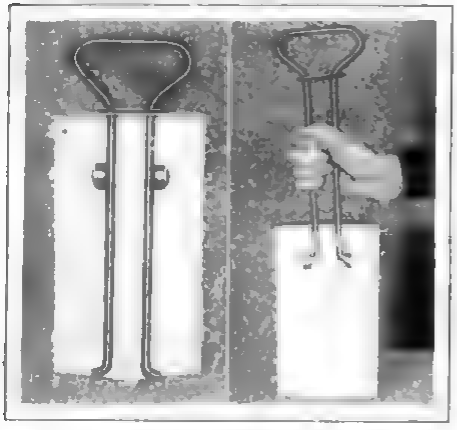
This revolutionary ship is practically all wing, with four power heads, each with a new type helical screw propeller, mounted on a streamlined spinner. Helium space inside the wing adds to its lifting power, and the inventor expects a full-size model to be capable of fast stratospheric flight.

Compressed Air Torpedo Check

AN anti-torpedo device, operated by compressed air, which will automatically either prematurely explode an approaching torpedo or deviate it from its course, has been invented by Major Van Rolleghem of the Belgian army, and is to be tested at Ostend.

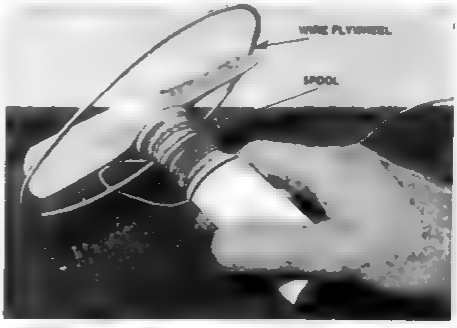
Folding Spade Fits Auto Pocket

A FOLDING spade which fits into an auto pocket yet opens to workable size has recently been placed on the market. A strong handle locks in place, but is easily released by merely pressing together the handle bars. The size closed is 11 by 18 inches.



These two photos show the handy folding spade closed for carrying in auto and open for use.

Flywheel for the Toy Helicopter



A flywheel of stiff steel wire fastened around the ends of the blades, greatly increases the efficiency of the toy helicopter shown in the photo above.

THAT well-known toy resembling a helicopter, consisting of a wood or metal propeller of two or four blades, rotated by a spool around which a cord is wrapped and then suddenly yanked off, can be improved by adding a flywheel to the propeller.

This flywheel is merely a circle of strong wire passed around the propeller and fastened to the ends of the blades. Cut notches in the blades to receive the wire, and fasten in place with brads or screws.

It is necessary to join the wire ends *securely* together, by soldering or welding. Otherwise, they will fly apart at the first ascension. Use steel piano wire, if available. That made of iron or copper generally is too soft. The wire should not be too heavy.

In starting the flight, do not pull the cord too suddenly. Give the flywheel time to gather speed. Also, it is wise to hold the toy well above the head, so that if the wire does come loose, it will not cause injury.

Pneumatic Bed Raft Appears at English Water Resort

WITH the accessible beaches becoming more crowded and littered each season, an English inventor has come forward with a comfortable bed raft which will enable the vacationist to acquire that coat of tan without being stepped on or having sand kicked into his or her eyes.

The raft consists of a folding wooden frame supported by an inflated air mattress. The cover can be snapped on quickly.

Supported by a cushion of air, the sun bather may sleep or read on this raft, as shown, while rocked gently by the waves.

Auto Cooker Uses Exhaust Heat

This cooker on the running board of his auto makes the motorist independent of roadside restaurants, community kitchens, and camp fires.

THE drudgery has been taken out of picnics with a compact device that is attached to the automobile running board and which utilizes the waste heat from the engine for cooking. While driving to your favorite camping spot food may be baked, stewed or roasted without cost for fuel, loss of time or interference with the efficiency of the motor.

The device cooks without water and therefore the edibles retain their natural juices and flavors. The cooker rests on an asbestos pad and is connected to the exhaust by a flexible pipe.

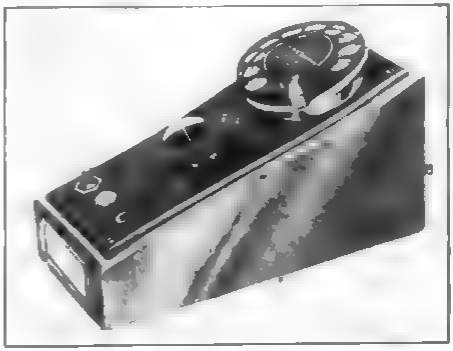
Mending Broken Band Saw Blades

IN MENDING broken band saw blades by brazing without the use of a torch, first file the broken ends smooth, then take a small piece of brazing material and flatten it out to make a thin piece about an inch long. This is placed between the broken ends of the band saw which are lapped over the ends.

Next heat a pair of flat tongs until red and apply borax to the break. Clamp the ends together with the tongs and hold until the saw turns red at this point. The ends are then brazed together. One band saw that had given long service has been brazed several times in this manner.

Automatic Dial Tuning Device

CATCH-as-catch-can tuning of radio programs is eliminated in the automatic dial tuning device shown below. Each of the ten numbers of the dial corresponds to a radio channel. The center knob controls volume while the toggle switch below turns off the mechanism.



Tuning in the desired radio station is now as simple as dialing a number on a modern telephone.

Science Hatches Oysters

Oyster fishermen's schooners in port in Baltimore, Md. These boats ply the waters of Chesapeake Bay, which produces famous Blue Point Oyster.

by EARLE W. GAGE

The oyster, one of the world's choicest table delicacies, was threatened with extinction until science stepped upon the scene and discovered that artificial propagation was possible. Now, by processes explained in this unusual article, scientific hatcheries can produce at will an abundance of any kind of oyster that public taste may demand.

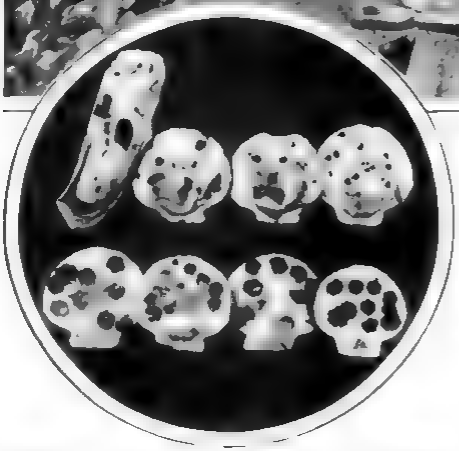
Scientist at oyster hatchery studying minute oyster infants under microscope. With artificial methods of propagation, 90% of young live to adulthood.

THE greatest mother in the world can lay 500,000,000 eggs at a single sitting. If all the descendants of a single mother oyster were to live until the fourth year, they would form a family reunion as large as seventy of our earths rolled into one mammoth ball. Then, too, there are all the innumerable children of the trillions upon trillions of other oysters, whose combined offspring would make a sphere bigger than the largest planet spinning through space.

Were not nature almost as ruthless to take as she is bountiful to give, in a short time the harbors of the world would be jammed with oysters. But the toll of life, especially during the first two days, is so

on Mass Production Farms

Fishermen are shown above dredging the bottom of Chesapeake Bay for oysters. Insert above illustrates size of family reunion, after four years, of oysters descending from one mother.



Greatest enemy of the oyster is the periwinkle, which drills through his victim's shell and sucks out meat. Photo shows results of depredations.

high that but a small percentage of the hundreds of millions of invisible organisms survive, and so few of the remainder grow to table size that the world is threatened with an oyster famine.

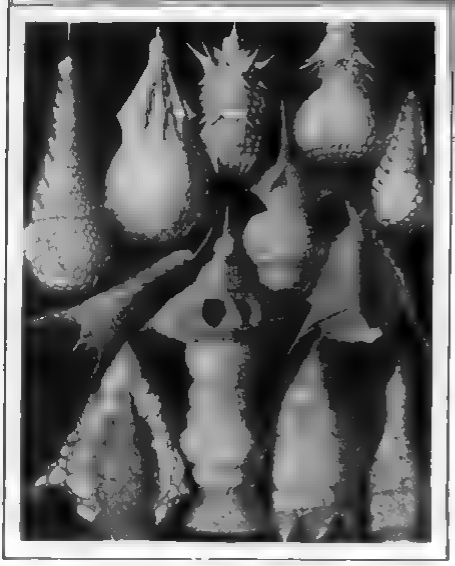
Science, stepping in to act as wet-nurse to the oyster tribe, has discovered amazing facts about the unknown life of the humble bivalve. Today, hundreds of billions of oysters are incubated in hatcheries as easily as chickens, while adolescent oysters are raised on "oyster farms" to provide our dinner table with the delicious food. Delving into the secret life of the oyster, science finds it as easy to propagate oysters as to raise potatoes.

Few of us realize, as we partake of the piping-hot stew or cool half-dozen on the half-shell, that the infant oyster has but one chance in twenty million of living to be served on our dinner table. Only a few hundred of the millions of oysters laid ever survive to reach the kitchen. Toiling alone, unassisted by science, infant oysters are unable to overcome the numerous enemies infesting the best oyster waters.

When science stepped in to rear the oyster, a great industry was threatened with extinction. Thirty-five countries have oyster fisheries. Nearly 30,000,000 bushels of

Science Lowers Oyster Infant Mortality Rate From 99 to 10 Per Cent

Baby oysters are raised from seed, or "spat," in glass jars at oyster hatchery as shown. When they have grown to point where they can shift for themselves, they are "planted" on bottom of bay.



Oysters feed upon minute radiolarians, extracted from sea water. Skeletons of these single-celled organisms, magnified 500 times, are shown above.

oysters are harvested annually, four-fifths of them being dredged from American waters. France, Japan, and China account for the greater part of the remaining one-fifth.

The date of the first use of oysters as human food is filed away in the forgotten records of antiquity. It is known that Sergius Orata, a wealthy Roman statesman, who lived in the days of Julius Cæsar, was first to attempt to raise oysters by artificial means. He operated the first "oyster farm," having discovered that, by suspending bundles of brush in Mediterranean waters he was able to catch baby oysters and thus increase the oyster harvest. This ancient method was destined to revolutionize oyster breeding in our own time, and save the oyster from passing the way of the prehistoric monsters, into memory.

Professor W. K. Brooks, of Johns Hopkins University, devoted a life time to studying the habits of oysters, and discovered that artificial propagation was possible. But he was unable to discover the methods necessary to carry out the work. Dr. William F. Wells, biologist of the State of New York, in charge of the Bayville, Long Island, hatchery, was the pioneer of this interesting discovery.

Carried to its fullest degree, this hatching method means that oysters may be reared as plentifully as potatoes. At will, science may produce fat or thin, long or short oysters, as public taste may dictate. But it requires between two and five years to produce that single moment of delight as one slippery oyster glides past the palate of the consumer.

The bays and estuaries along our coasts are stocked with oysters hatched in laboratories, much as chicken eggs are transformed into living hens and roosters in incubators.

The humble cream separator, commonly used on the dairy farm, was the implement

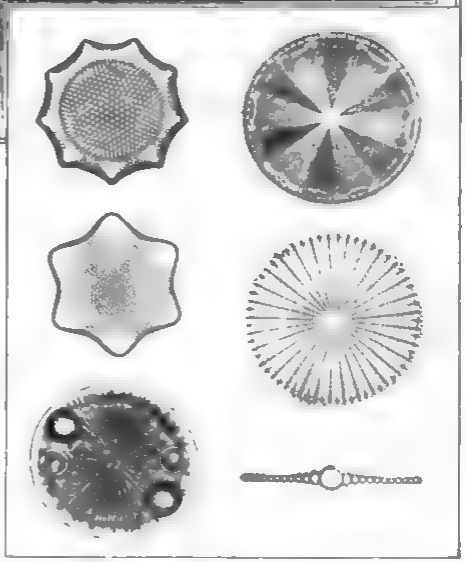
In this most common method of oyster fishing, the bottom of bay is dredged from small boat with a scissor-like scoop having claws similar to a rake.

which solved man's long struggle to fathom the mystery of oyster culture. Dr. Wells believes that this machine is destined not alone to save the oyster from extinction, but that it ultimately may be used to revolutionize all shell-fish culture.

Inside the oyster hatchery we may see giant glass jars, filled with pure water. The milky looking substance floating about in the water are billions upon billions of potential oysters, minute living bodies invisible to the human eye. Born yesterday, these have no shells, but in two or three weeks they evolve a feathery coating.

Placed under a powerful microscope, we may watch thousands of little organisms wiggling about over an area no larger than a pea. The infinitesimal creatures open and close their minute mouths as they take in nourishment, swimming about in a sprightly manner. A tablespoonful of the creamy water contains millions of potential oysters —enough to serve many oyster suppers.

Today oysters are hatched in the laboratories during the summer months, safe from the myriads of creatures which feed upon the oyster eggs, protected from the surging waters which tear the helpless creatures loose from their anchorage and smother them. Although 99 per cent of the oyster eggs laid in open waters are sacrificed to nature's ruthless army, with but one per cent surviving to reach the dinner table, biological engineers, working in oyster hatcheries, now are able to rear more than 90 per cent of the oysters and thus multiply the supply.



Here are diatoms, magnified 350 times, upon which oysters feed. From water which is breathed in for oxygen, these microscopic animals are extracted.

The oyster is the product of untold centuries of indolence. In the remote past he elected not to walk, so today he must anchor himself to an object beneath the surface of the sea. What was once a foot, or perhaps two feet, is now a scarcely distinguishable protuberance. But the oyster has never lost his ability to see and speak. Place an oyster in a tank of water near a window, draw the shade and close out the light, and he will close his shell. He can see.

Science Can Produce Any Kind of Oyster That Public Taste May Demand

The saying "as close as an oyster," or "as tight as an oyster," long fooled science, the belief being general that an oyster seldom opened its shell. However, down beneath the waves the oyster keeps busy breathing and eating, and therefore, most of the time, its pearly gates are ajar.

The oyster renews his pale blood by taking in the oxygen or air from the sea water. In the water also are the tiny seaweed or algæ and diatoms—microscopic organisms. The oyster's gills and mantle are kept busy getting a supply of food, air and drink.

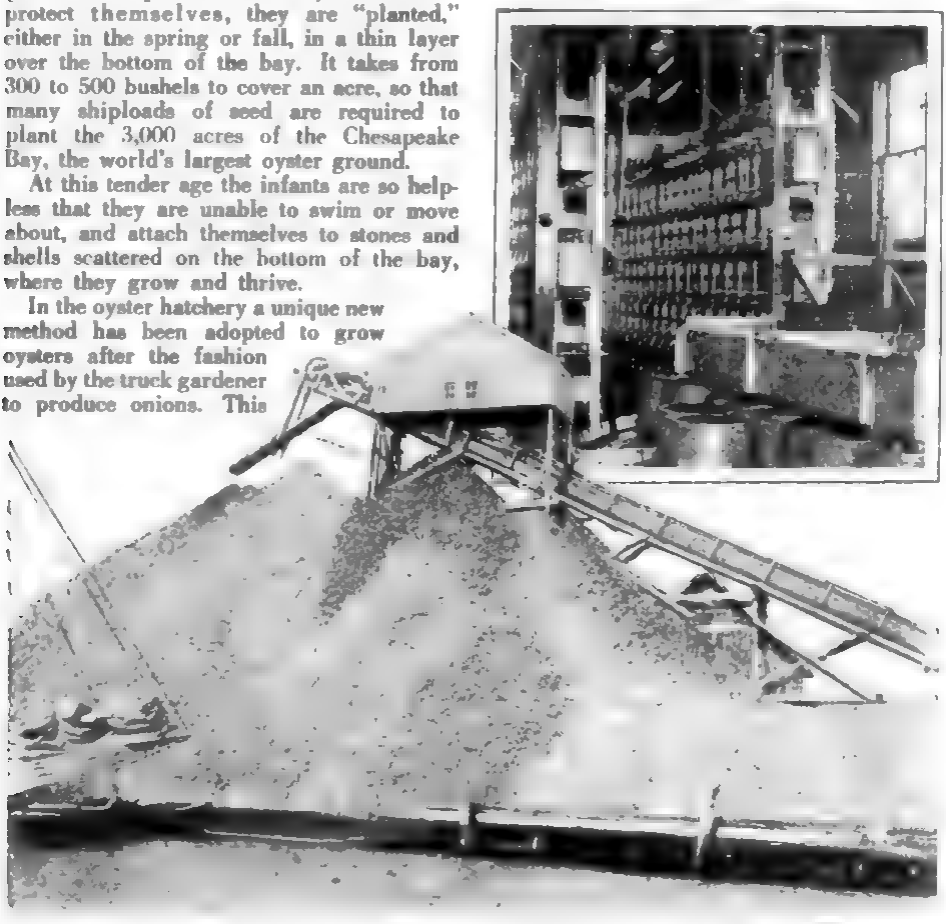
The common practice in oyster farming consists in raising the baby oysters from "seed," or spat, and when the oysters have grown to a point where they are able to protect themselves, they are "planted," either in the spring or fall, in a thin layer over the bottom of the bay. It takes from 300 to 500 bushels to cover an acre, so that many shiploads of seed are required to plant the 3,000 acres of the Chesapeake Bay, the world's largest oyster ground.

At this tender age the infants are so helpless that they are unable to swim or move about, and attach themselves to stones and shells scattered on the bottom of the bay, where they grow and thrive.

In the oyster hatchery a unique new method has been adopted to grow oysters after the fashion used by the truck gardener to produce onions. This consists of a lime-covered plate, which, as soon as the oysters are ready to set, is placed in a large wooden tank, where the oysters grow in protected water until large enough to place in the bay.

"Here we complete the cycle," explained the oyster hatcher. "We extend the culture from the oyster back to the egg, and bridge the gap between the adult and the young. In other words, we are developing a process of hatching and incubation, and believe that oyster culture will soon be on a par with plant and animal culture. This means that we may breed the oyster family upward, and insure consumers with a gener-

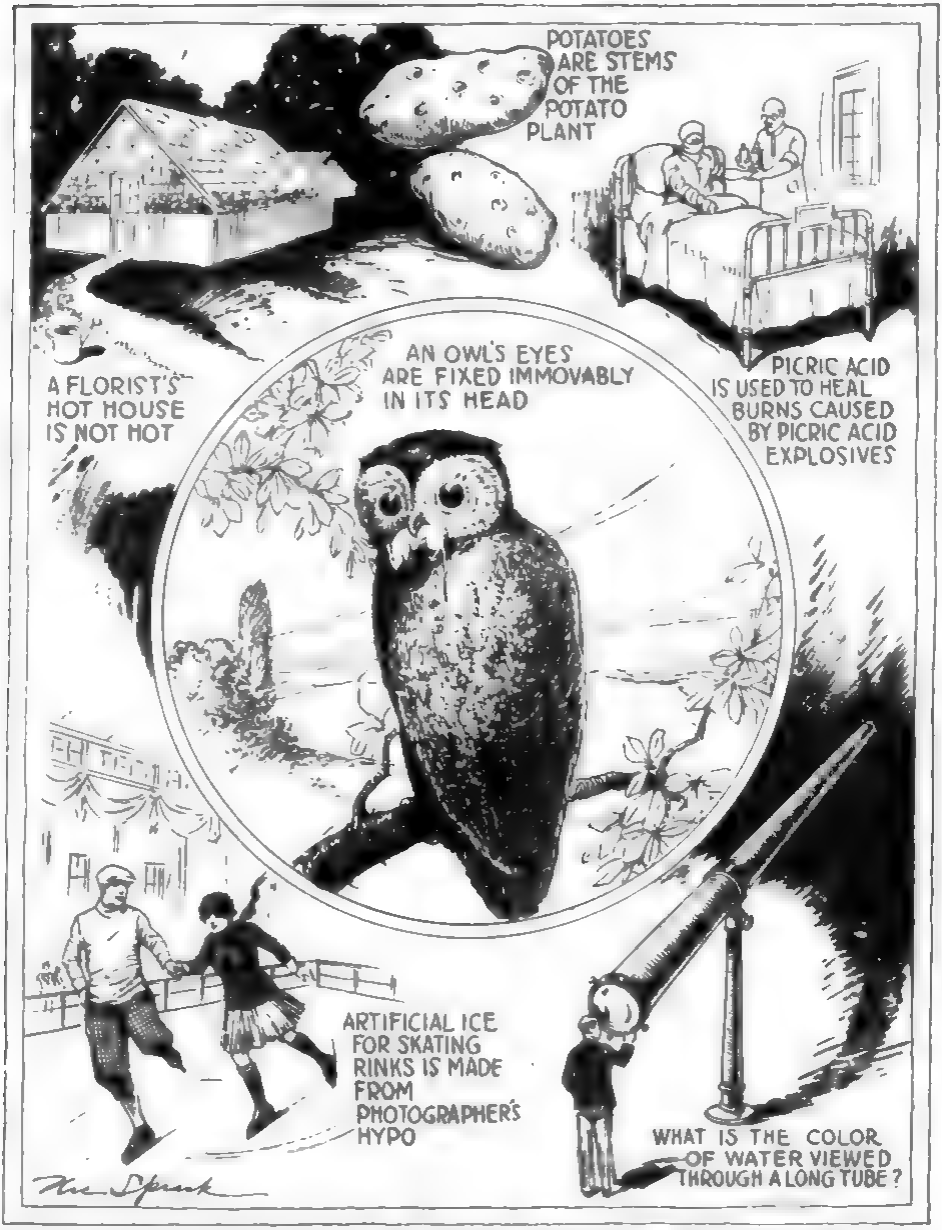
(Continued on page 180)



Top photo shows oyster incubator, with tanks in which infant oysters are raised. Below—When oysters have been removed, shells are dumped in huge pile. From the shells are made buttons, knife handles, etc.

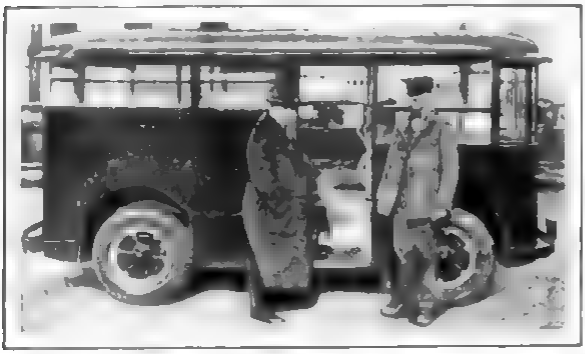
Oddities of Science

by NIC SPRANK



A green house seems hot because of the high humidity. The hypo solution is frozen over a board floor in the skating rink and smoothed out with a hot iron. Water is blue when seen through a long tube. What odd scientific facts have YOU observed? Send in your contributions—if they're unique enough to use, your name will be printed as author. Send facts to Nic Sprank, care of Modern Mechanics and Inventions, 529 South Seventh Street, Minneapolis, Minn.

Auto Like Midget Street Car Adopted by Postal Service



New auto truck adopted by Uncle Sam for distributing mail.

TO EXPEDITE the collection and distribution of mail, the Post Office Department at Washington has adopted a new truck which is attracting wide attention by its unique design. Closely resembling a midget trolley car, the auto has windows around the entire circumference of the body and a wide door in the center on either side. Taking into consideration the necessity of the mailman to do a lot of stepping in and out of the bus, designers have built the running board unusually close to the ground, permitting quick and easy entrance and exit. The odd vehicle is shown in the photo at the left.

Science Studies Odd Quake Lights

ANOTHER ancient report long rejected by science as a baseless superstition has been justified by actual investigation. This is the claim that mysterious lights in the sky often accompany earthquakes. In November, 1930, a destructive earthquake occurred in the Idu peninsula, in Japan. Many people reported at the time seeing red, blue and yellow lights in the sky but, as usual, these reports were ridiculed by orthodox scientists. One Japanese scientist, Mr. K. Musya, chanced, however, to see the lights himself and to have good reason, therefore, not to accept the orthodox opinion. He proceeded to collect observations from everyone whom he could find who had seen the same phenomena. In a recent report he produces more than 1,500 such observations, certainly too many to be explained away as imaginary.

Transformer Prevents Frozen Pipes

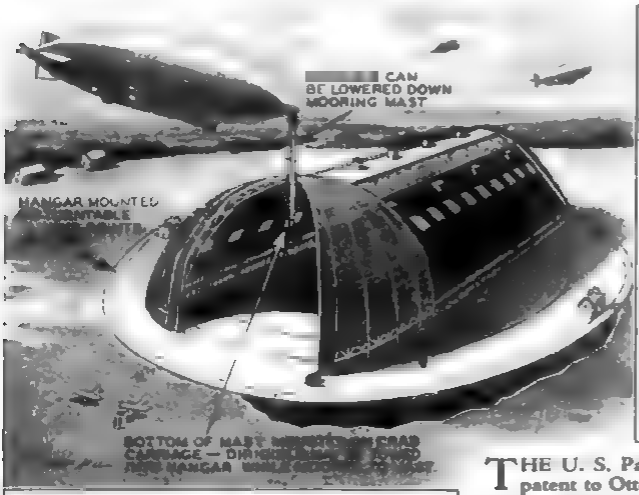
ELECTRICITY is employed in a new German device which prevents freezing of water pipes. A power transformer taking its current from the house wiring is connected at two points on the pipe, which is heated by the flow of electricity through the metal, this preventing freezing.

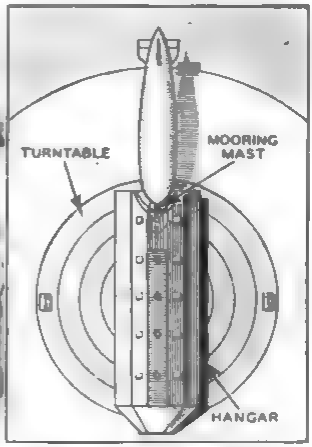
Coin-in-Slot Automat Delivers Ice

This mechanical ice man delivers a 25 lb. ready-wrapped cake of ice when coin is put in the slot.

MEET the new ice man — an automatic ice-distributing automat which has recently made its appearance in Los Angeles. You simply drop fifteen cents in the slot and out comes a 25 lb. ready-wrapped cake of ice.

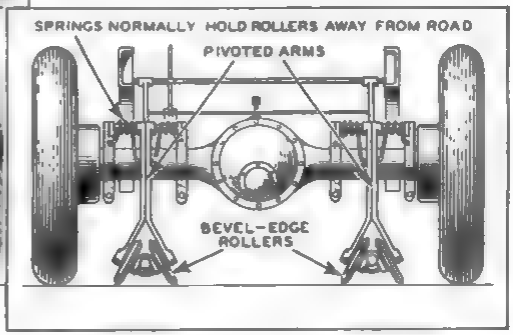
Recent Patents of UNUSUAL Interest





THE U. S. Patent Office has recently issued a patent to Otto Kreil of Berlin, Germany, on a rotary dirigible hangar and mooring mast which will eliminate much of the danger, delay and expense in landing airships of considerable size. The hangar and its base are rotated until the wind sweeps down the roof toward the mooring mast. When the dirigible has been moored it may be lowered down the mast until it reaches the entrance of the hangar, bringing the nose of the craft into position for entry. The "crab" carriage then tows the airship into the hangar without removing it from the device to which it is moored.

HIRSCH Low-Vogel of Vienna, Austria, has been granted a patent on a typewriter having only fourteen keys, four of which are used for carriage and ribbon control. The other ten are writing keys and are in alignment with the tips of the operator's fingers. Each of these ten keys is connected with a type bar, each of which carries at least three characters in a longitudinal row. When the carriage is in its normal position the middle character will be typed when the key is struck. Shift keys at the right and left bring the upper and lower characters into alignment for typing. Spacing is controlled by two space bars. The machine should be especially useful in allowing the blind to type

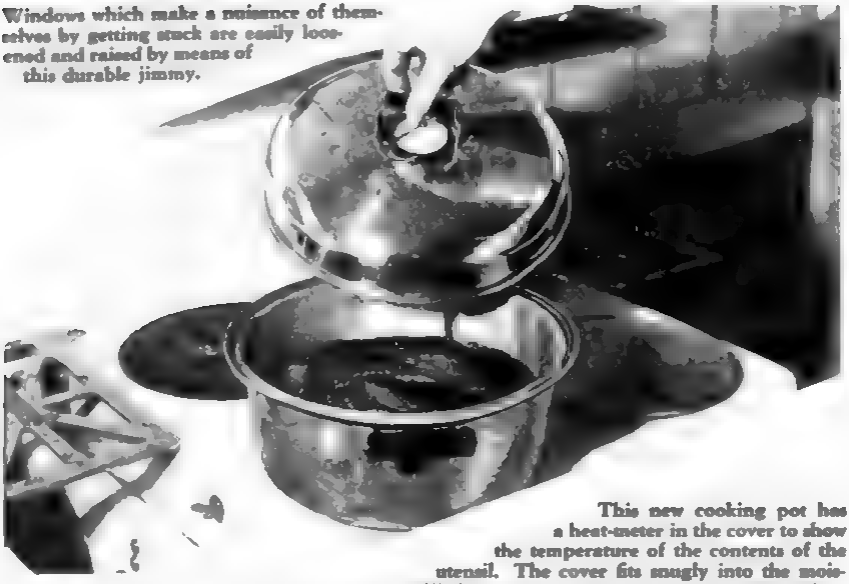


AN INGENIOUS device for preventing skidding has been patented by Carl Uhlman of San Francisco. When the automobile begins to skid the driver steps on a pedal, causing an arm, which is pivoted to the rear axle housing, to swing downward, bringing beveled rollers in contact with the roadway. The rollers, rotating upon an inclined axis, do not impede the forward motion of the car, but bite into the pavement with any sidewise motion and effectually stop the skid. When pressure on the pedal is released the rollers are returned to their normal position by small springs. Whether the various highway departments would permit the use of such a device is something else again.

New Mechanical Helpers

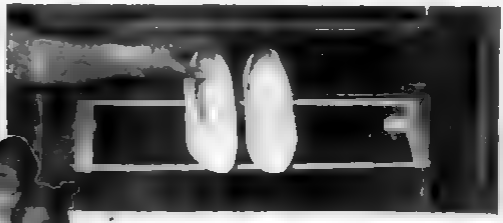
Fuel bills for cooking are reduced to a minimum by means of a new pan, shown in the photo at the left. Made of heavy, durable aluminum, it has a black bottom which absorbs heat so readily that scientifically accurate tests show a fuel saving of 10 per cent on gas and 20 to 40 per cent with various types of electric stoves. The new black finish not only increases heat efficiency, but is extremely resistant to flame and wear. Regulation handle is provided.

Windows which make a nuisance of themselves by getting stuck are easily loosened and raised by means of this durable jimmy.



This new cooking pot has a heat-meter in the cover to show the temperature of the contents of the utensil. The cover fits snugly into the moisture-filled, vapo-seal groove, automatically sealing in the vapors and keeping the food from cooking dry. The meter shows the exact temperature, and once the heat is set you can leave the kitchen until meal time. Fine candy, preserves, and other such choice foodstuffs are also easily cooked with very little watching and stirring.

Make Housekeeping Easy



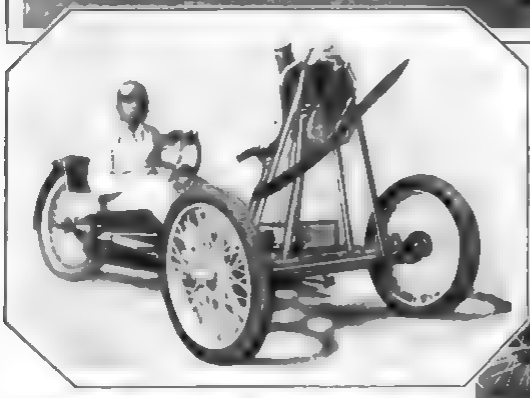
This new shoe rack, which hangs on closet door, holds shoes in position easy to find and greatly increases closet space and convenience. It is instantly and easily attached.

Designed to keep the kitchen cool in summer, new blanket for range prevents heat escape.

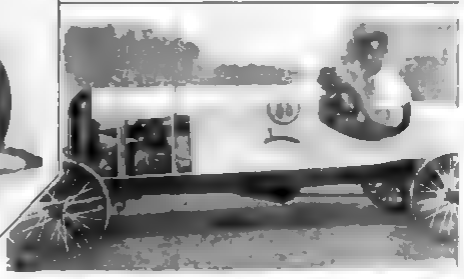
Safety for hands of operator is provided by this device, which fits almost all washing machines. In use, the clothes are placed on the end of the belt which leads to wringer rollers, thus keeping hands away from rollers. If hands get tangled in clothes, top frame rises and shuts off current.

3-Wheel CYCLE CAR

Walter C. Pratt and his cycle-car which won the first prize of $100.00. Built entirely of junked auto and motorcycle parts, the job costs less than $25.00 complete.



John Hopkins of Billings, Montana, seated in the wind-wagon which won for him the $50 prize. $35 covered the entire cost of the materials for this car, including the prop and the motorcycle engine.



Charles Schilcher of Glendale, New York, broke even when he built this neat little one-lung racer, for the $25 he won just covered the building cost.

WALTER C. PRATT, Ladies and Gentlemen, chug-chugs off with a pink check for one hundred dollars as winner of the Baby Auto Contest which was announced in the June and July issues of MODERN MECHANICS AND INVENTIONS. Walt, as you can see from the photo, is just a young fellow who lives at 10407 Brighton Road, Cleveland, Ohio.

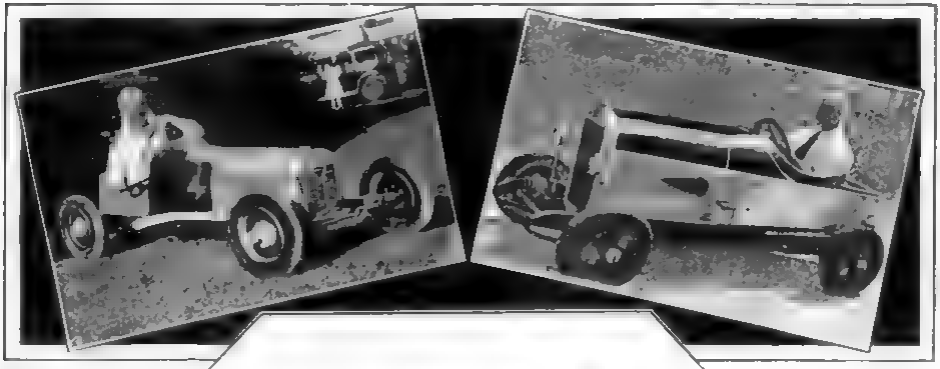
Walter's car comes entirely within the scope of the rules as set forth when the contest was announced. It is powered with an Indian Chief motorcycle engine which gives it a speed of between 60 and 70 miles an hour. As most of the parts were picked up in the junk yard, the materials cost less than $25.00. Other details are as follows:

The front assembly is taken from an old Model T Ford, with tie-rod, axle, drag-link and spring cut down so as to give a 42-inch tread. The front wheels, steering gear and frame are from the same Ford.

The rear assembly is an Indian Chief motorcycle cut above the front and center sidecar fittings and just ahead of the upper engine mounting, giving a 98 inch wheelbase. The dummy radiator is from an old Oakland, also cut down to improve the appearance.

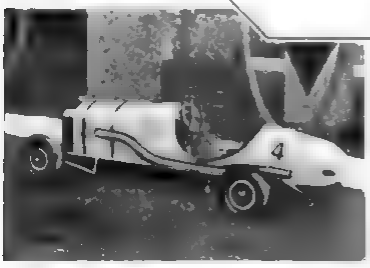
The controls are standard, with standard

Wins AUTO Contest



Huber Wittman, who lives at 3812 Ray St., San Diego, Cal., took one of the $5 prizes with this Henderson-powered racer costing $185. Other $5 winners are shown on this page.

Richard and Robert Kern of 11 East Lincoln Street, Bellville, Illinois, get 72 miles an hour from their Henderson - powered racer which cost only $68.40 to construct.



This midget front drive racer is the work of J. Herman Pehrson of 2614 Victor St., Bellingham, Washington.

One of the neatest looking entries in the entire contest is this front-drive Indian 4 powered racer. It was built by Edward W. Borntraeger, 2118 Fremont St., Chicago. Weighing 492 lbs., it has an 83″ wheelbase, a 43″ tread, and stands 26 inches at its highest point.

Gardner W. Turman, 985 Tenth St., Boulder, Colo., straddles the engine of his glorified roller-skate shown above.

clutch and brake pedals, gear shift, and foot accelerator. A Chief gas tank was used, with the baffle separating the oil and gas punctured so as to give greater capacity. The tool box was soldered up and is used as an oil tank. A large automobile brake and an extension on the kick starter shaft complete the outfit.

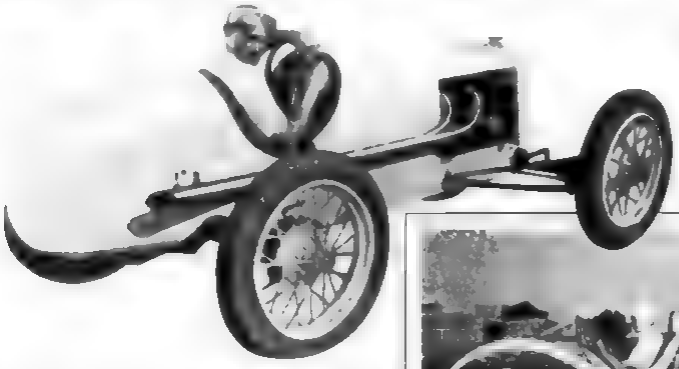
The second prize of $50.00 was won by John Hopkins of 714 North 30th Street, Billings, Montana. This bus is also a combination of junked auto and motorcycle parts, but the V-twin engine turns 51-inch propeller to give 50 miles an hour on paved road.

The front end of this job is also a Model T Ford, the spring and wishbone being underslung. The frame is of 1¼″ by ¼″ angle iron with 1½″ by ¼″ by 42″ U iron over the front spring. The angle iron along the sides is 5′10″. At the rear end of each angle iron is connected the middle and bottom leaves of a Ford front spring. The spring is cut in half and bolted to the angle iron, with the rear axle passing through the bushing of the bottom leaves. The entire outfit cost only $35.00.

Charles Schilcher, of 7028 72nd Place,

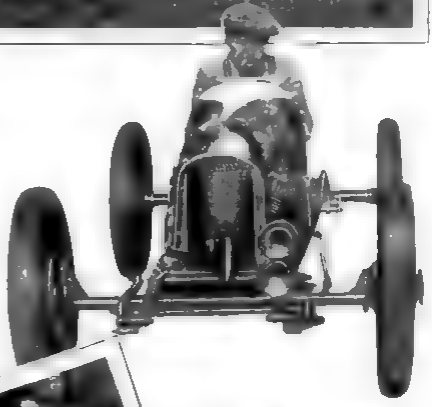
(Continued on page 170)

Auto Contest Honorable Mention List Includes Many Speedy Racers

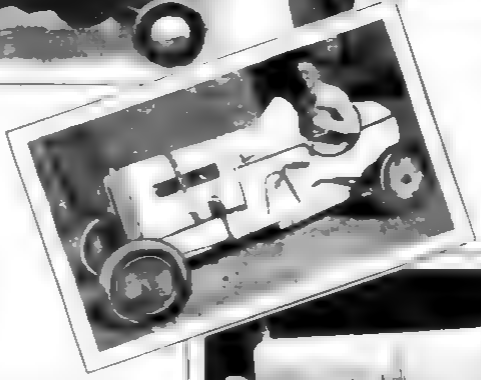


Resembling somewhat the record-breaking speedster of Malcolm Campbell, this streamlined cycle car designed and built by William Harbaugh of 843 So. Claremont St., Ashland, Ohio, does 75 miles an hour with a Harley "74."

Above is the home-built baby racer of Troy Flynt, 1029 Third Ave., Laurel, Miss. This all-steel job does 35 miles on a gallon of gas and hits 75 per hour on good roads. It has an 84-inch wheel-base and 55-inch tread, and is powered with a four cylinder Chevrolet motor. Mr. Flynt did all the work himself except welding.



Gilbert Englemann, who parks his "Felix II" at 2312 Perez St., San Antonio, Texas, says he built his car for a total cost of $5. An Indian twin drives the midget at a speed of about 45 per. Englemann even made his own roller bearings. Metal was obtained from a dump ground.

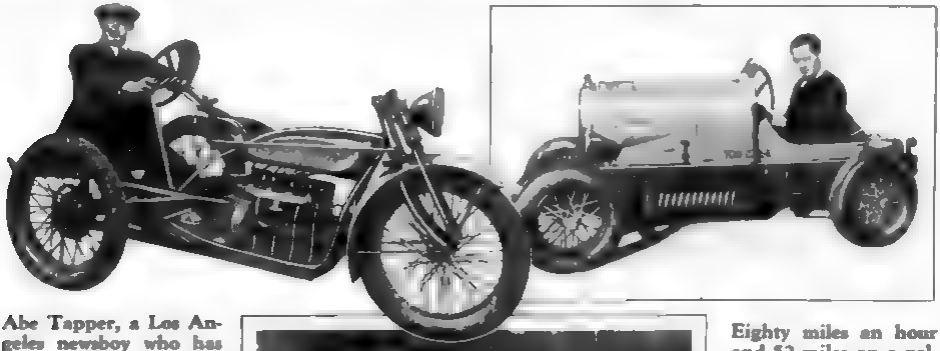


Fred Hohenauer and Frank Kieger of 1270 Topping St., St. Paul, Minn., spent close to $2,000 on this supercharged, Harley-powered speedster, which has been clocked at 70.

The car pictured above is powered with a Ford Model T engine and does 48 miles an hour with a 3-1 gear ratio. As junked Fords, cut to size, were used throughout, the only cost of building was for tires, rims and paint. The disc wheels are home-made. The gear and brake levers are on the outside of the car. There is a clutch on the inside that is worked by the left foot, the right taking care of the throttle. This is the work of Stanley Ward, who lives at 305 Lincoln Avenue, Pasadena, California.

A professional-looking job by a skilled mechanic is the white speedster illustrated above. It was built entirely by Jack Waldrip, 5239 Wentworth St., Oakland, California, at a cost of about $200. Parts of old cars were used. The frame was cut to undersling the rear wheels.

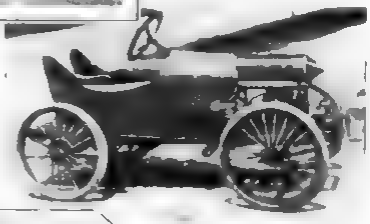
Striking Originality of Design Brings Honorable Mention to Midgets

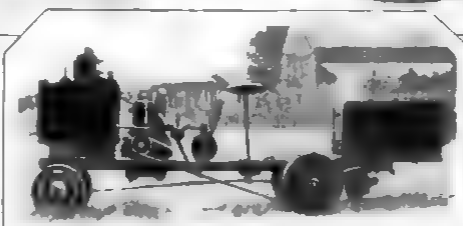


Abe Tapper, a Los Angeles newsboy who has been unable to walk since childhood, built for himself what is probably the world's fastest wheelchair. A one lever control synchronizes the brake, clutch and gas feed. It does 55 an hour.

Eighty miles an hour and 52 miles on a gallon of gas is the record of Tom Case's home-built racer, shown above. A Harley motor and discarded parts from several cars cost the Modesto (California) man about $200.

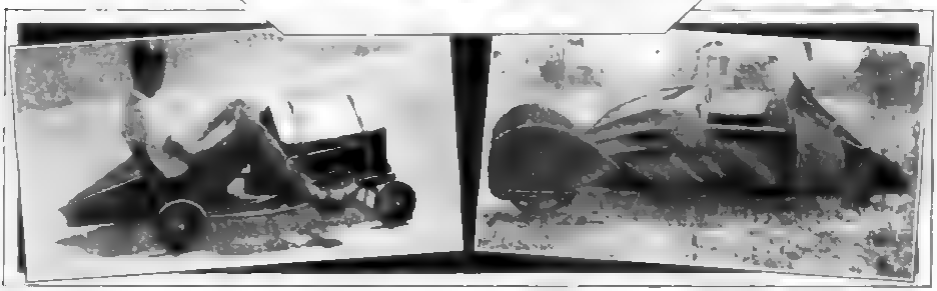
Don Arlen of 608 North Plymouth Blvd., Hollywood, Cal., got 90 miles an hour from this 4-cylinder Indian powered racer.





Powered with a Henderson "4" motor and costing only $130 for materials this neat midget does 40 miles per hour. It was built by C. E. Schultz of 25 No. Fifth St., Fort Dodge, Iowa.

Fred W. Pickell, 3130 Coit Road, Grand Rapids, Mich., built the above buzz-buggy in its entirety, even to the engine and transmission. It could do 40 miles an hour all day.



The three cars pictured above may not be the last word in workmanship, but you'll have to admit that the lads showed ingenuity in overcoming the embarrassing lack of funds common with youngsters to build these motor-bugs at practically no cost. The car at the top cost Dewey Slocumb Jr., of Goldsboro, N. C., $1.50. Paul Beshore, of Kearney, Nebr., made the one at the left for $7.90 and gets 35 m.p.h. The car on the right, using a washing machine motor, gives Clyde Hughes 25 miles per hour.

Causes of "Floods of Mud"

Mud-clogged highways and stalled autos are disastrous effects wrought by mud waves sweeping down canyons. In this photo, taken at Farmington, Utah, after flood, mud was four feet deep.

Cloudbursts which cause floods of mud are primarily responsible for formation of irregular, vertical-walled arroyos found in the southwest. Above is scene from Grand Canyon, Colorado.

by IVAN E. HOUK

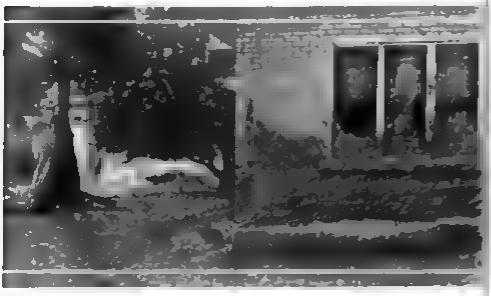
What were the causes of the mysterious floods of mud that have swept down from mountain sides spreading death and ruin throughout adjacent towns? This article explains these strange occurrences of nature and describes the fantastic topographical effects sometimes wrought by them.

THE floods of mud which we often read about in newspapers during summer months are not mythical creations of some one's vivid imagination. They are actual, bona fide occurrences. Although the consistency of flow in the different floods of mud varies widely, the fact remains that in such discharges the mixtures of earth and water are thick enough that they are quite properly referred to as "mud".

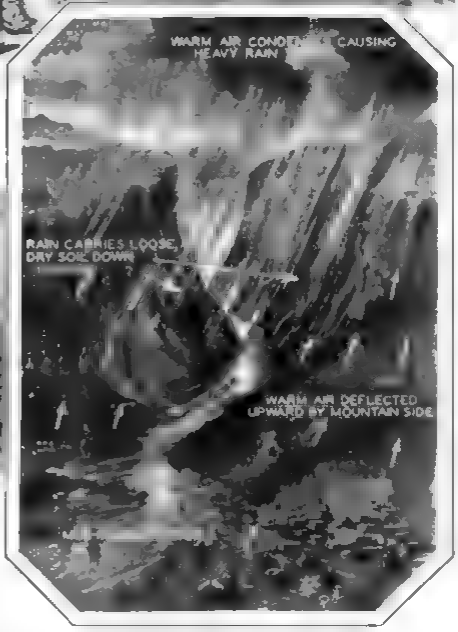
During the evening of August 13, 1923, floods of mud came out of canyons on the western slopes of the Wasatch Mountains in northern Utah, overwhelming all objects in their paths. Hogs, cattle, horses, barns, houses, orchards, human beings, and all other objects that happened to be in the way of the moving mud were carried to destruction. Nine people were killed, including four boy scouts who had camped for the night near the mouth of one of the canyons. Property valued at more than a hun-

Now Explained by Science

Huge boulders and trees were moved by this mud flood which occurred at Willard, Utah, in 1923.



A vivid idea of the serious damage done by mud floods may be gained from this photo of a house situated on main street of Willard, Utah.



Mud floods are most frequently caused by cloudbursts occurring over mountain side or canyon composed of loose, dry soil. Downpour carries soil and debris in fan-shaped waves over lower areas.

dred thousand dollars was destroyed at Willard and Farmington where the devastation was most pronounced.

Floods of mud are caused by the occurrence of cloudburst rainfall in arid or mountainous country. Naturally, if the topography where the cloudbursts occur is both arid and mountainous, as it is in northern Utah, the resulting floods of mud are most severe and destructive.

Being caused by cloudburst rainfall, floods of mud are often referred to as "cloudburst floods". They are a dangerous and destructive phenomenon of nature, and usually cause devastation and ruin whenever and wherever they occur. This is especially true if they occur in mountain canyons, as they did near Willard and Farmington. In such cases they sweep everything before them; so that by the time they reach the mouth of the canyon they contain large

quantities of sand, gravel, rock fragments, boulders, logs, trees, and other debris picked up along the route, as well as large quantities of mud.

Sometimes boulders as large as houses are moved appreciable distances by canyon floods of mud. One large rock, approximately twenty-five feet in diameter and weighing more than five hundred tons, was moved three hundred yards during the Farmington Canyon flood. Sometimes huge boulders become dislodged during one flood of mud and are then moved along by successive floods until, ultimately, perhaps hundreds of years later, they reach the plains many miles from their original locations.

Canyon floods of mud usually cause a roaring noise which can be heard several miles in advance of the flood wave, the noise being caused by the uprooting, breaking, and rolling along of large trees, the dislodging, grinding, and crashing of huge boulders and the forming and breaking of debris dams along the path of the flood. Fortunately, the noise is usually recognized by residents of mountainous country. Consequently it serves as a warning to all within hearing distance, thus permitting many people to flee to places of safety.

Sometimes the floods of mud reach the mouth of the canyon in a series of waves only a few minutes apart, the first wave containing the coarsest and the greatest amount of debris, and the succeeding waves gradually becoming thinner and thinner, until, finally, the moving mass consists of ordinary flood water.

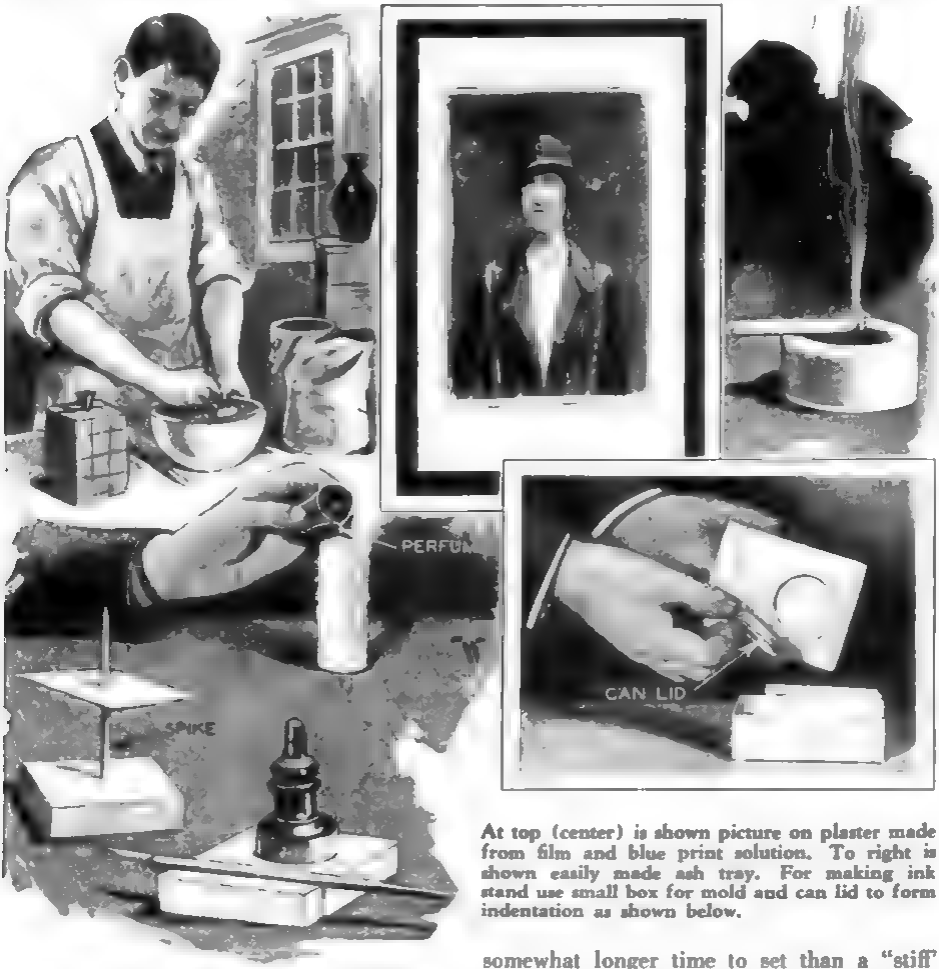
As soon as the flood waves reach the plains they spread out in fan-shaped areas depositing their loads of material in layers of gradually decreasing thickness. Sometimes the total deposits left by a single flood are as much as twenty feet deep and

(Continued on page 188)

Fantastic effects of cloudbursts on dry, loose soil is seen in this remarkable photo of eroded walls of Bryce Canyon, National Park, Utah.

Inset photo shows highway after being cleared of debris from mud flood at Bingham, Utah. Below—Farmington Canyon after famous August, 1923, flood. Note size of boulders moved by force of the flood.

Useful Novelties from Plaster of Paris



At top (center) is shown picture on plaster made from film and blue print solution. To right is shown easily made ash tray. For making ink stand use small box for mold and can lid to form indentation as shown below.

Plaster of Paris is mixed to fine paste as illustrated at the top. Below are shown the paper weight and spike, ink stand, and perfumer which diffuses fragrant odor throughout room.

DUE to the cheapness with which common plaster of Paris may be purchased and the ease with which it may be made into any form, it lends itself very well for the making of home constructed novelties such as picture frames, ash trays and desk sets.

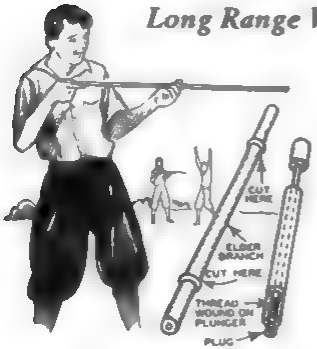
The photos above show a number of forms into which the plaster of Paris may be cast. The plaster is, of course, mixed with water just before using. For a fine grain cast, the mixture should be thin, and will require a somewhat longer time to set than a "stiff" paste. You can make imitation Italian marble by mixing paint in with the paste. When the cast has hardened, wax it with floor polish and rub till shiny.

If a small quantity of oriental perfume is poured into a cylindrical cast as shown above, you will have a novel perfumer that will last for many weeks. Here's another novel stunt—a plaster picture frame with a "built-in" picture. Spread over the photo section a blue print-making solution, and when dry place a gelatine negative of the desired picture over it, glossy side up. Expose in the sun for fifteen minutes, then remove the film and wash thoroughly.—Ken Murray.

HANDIKINKS

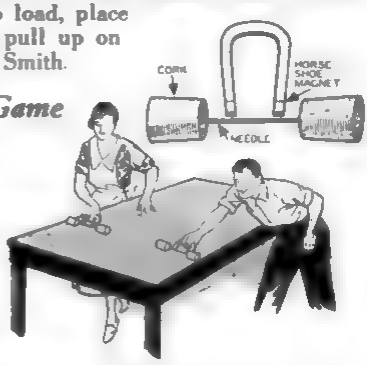
Handikinks are ingenious little stunts that handymen, motorists, workbench fans, etc., will find extremely helpful. You can save considerable time and effort at your various tasks by looking over these pages carefully.

Long Range Water Gun Has Barrel Made From Elder Branch



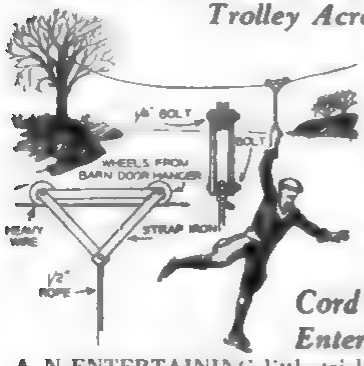
AN AMUSING little water gun which gives a thorough drenching to anyone within a range of ten feet may be made from an elder branch and a simple wooden ramrod. The pithy center of the branch is removed to take the ramrod, which is made from a piece of tough wood whittled down to fit the barrel bore. On the end of the ramrod cut a small groove and wind with fine thread, making a snug fit. In the plug which fits in the end a small hole is drilled for a squirt hole. To load, place the end in water and pull up on the ramrod.—George Smith.

Magnet Racing Game



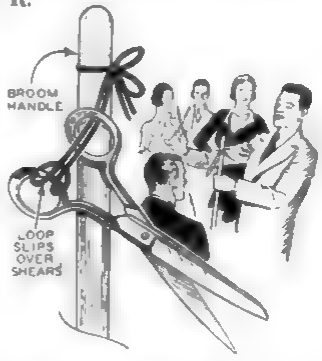
HOW would you like to play a game called magnet racing? It's easy and you can make the equipment yourself. What does the racing is simply a needle with a cork on each end, and its motivating power is an electro-magnet which leads the needles on as illustrated in the drawing at the right. The object of the game is to get your needle to the end first, without its touching the magnet. If the needle catches up with the magnet, the player is disqualified.—Hans Kutschbach.

Trolley Across Frozen Pond Teaches Skating Painlessly



FOR WINTER sports fans just learning to skate, here is a good instructor which eliminates painful falls on the ice. A heavy trolley wire is first strung up from trees on opposite sides of the stream. The next task is to make the trolley, using six pieces of strap iron and two barn door wheels, which are assembled as illustrated in the accompanying drawing. Grasping the rope, you can learn the foot work of skating without fear of falling.—Dale R. Van Horn.

Cord and Shears Trick Entertains Party Guests

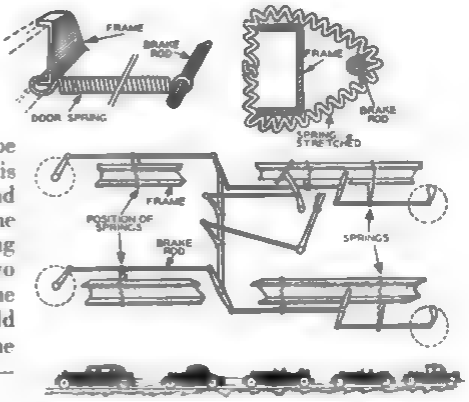


AN ENTERTAINING little trick for parties which will cause no end of puzzlement is performed with a broom handle, a piece of twine and a pair of shears. First, double the cord and slip the loop through one handle, then give it a half-hitch around the other handle as illustrated in the accompanying drawing. Finally tie the ends to a broom handle. The object is to remove the cord without untying the knot. Solution: Run the half hitch loop back through the first handle, then slip the string over the entire shears.—August Jeffers.

Stunts for Motoring Convenience

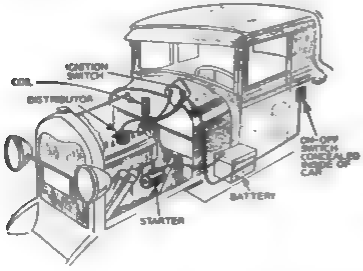
Springs Prevent Brake Rod Rattle

BRAKE rods on your car that have a way of rattling like a can on a dog's tail may be silenced by a surprisingly simple stunt. A few old screen door springs are the only materials needed. These, however, have to be operated on first. Pull them apart till there is about a half inch space between each turn, and then wrap them around the brake rods and frame of your car as illustrated in the accompanying drawing. Six springs, four at the back and two in front, will, when well greased, remove the rattle annoyance once and for all. Care should be taken to have the tension just right, else the springs will do a little rattling themselves.—Orvin Magnus.



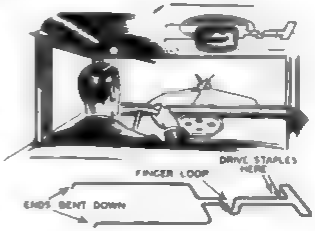
Concealed Ignition Switch Thwarts Thieves

NO BURGLAR can run away with your car if you hook a secret push-pull wall switch into the dashboard ignition switch circuit. The switch should be concealed somewhere in the car, well out of sight, as suggested in the accompanying drawing. One terminal of the switch cuts into the ignition circuit, the other terminal is grounded. Always turn off the juice before leaving the car. Locate the switch in a position known only to yourself.—Chet Sullivan.



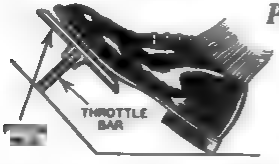
Convenient Auto Hat Holder Made From Wire

A HAT holder that can be attached to the front roof-beam of a car may be made from a wire coat hanger. The wire should first be bent as illustrated in the accompanying drawing, with the leading ends turned down and a loop finger hold bent into it. To operate, put the finger into the loops and pull down. Then slip the hat over the two prongs. Release the holder and it will spring back into place, holding the hat firmly against the roof of the car.—Walt Brixius.



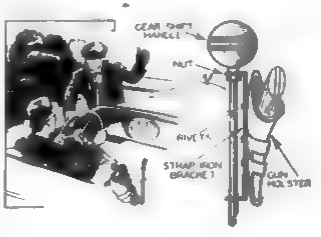
Piston Head Makes Improved Foot Throttle Button

THIS improved foot throttle button will add greatly to the convenience of driving. It is made from a light weight piston top, tapped, and screwed to the throttle rod. The edges are rounded on a grinder, the top having been cut from the piston with a hack saw.—Wilbur Steele.

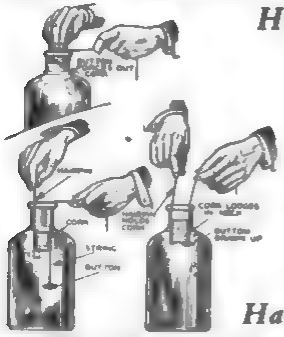


Reach for Gearshift and Get Gun to Foil Thug

WHEN forced to the curb by a hold-up man the necessity to shift gears puts this gun at your finger tips to thwart the robbery. A ten-inch piece of strap iron is bent over one inch at the ends, drilled with a half-inch hole and slipped over the gear shift handle after the top has been removed. To this strap iron support is riveted the leather holster which holds the gun in readiness when you presumably reach for the lever.—Thomas Moore.



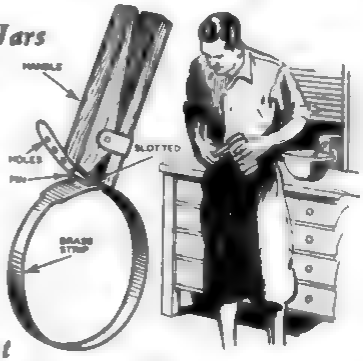
A Page of Ideas for Handymen



Hairpin, Button and Thread Pulls Cork From Bottle

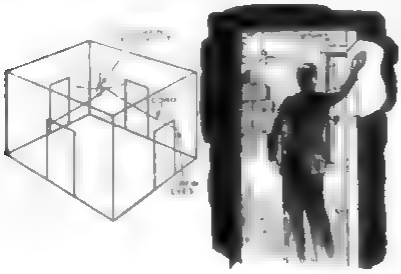
WHAT could be more vexing than to have a broken cork floating around in a bottle? This nuisance can easily be removed in this fashion. Procure a small but strong thread and to one end fasten a button as illustrated in the drawing at the left. Lower this into the bottle, at the same time inserting a bent hairpin to catch up the cork. Now draw the cork up into the bottle neck, and pull out the hairpin. All that remains to be done, then, is to pull the cork out with the thread and button. An extremely easy job, isn't it?—Shepherd Witman.

Handy Opener for Fruit Jars



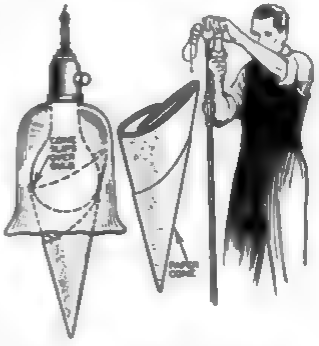
ANOTHER nuisance housewives frequently encounter is that of removing the stubborn top of a fruit jar. Such a task is the easiest one imaginable, however, with this handy opener on the job. The opener consists simply of a band of sheet brass mounted on the end of a handle cut to the shape shown at right. The end is slipped through a slot and is drawn to necessary size by inserting the peg in any of the holes. This same method may be used for tightening the jar covers.—Hi Sibley, Jr.

Extension Chain Prevents Groping for Light



MANY cellar lights are placed in dark corners as afterthoughts, and are thus not easily accessible. To avoid the necessity of having to grope around in the dark for the switch, string up extension pull chains at convenient points about the room. A strong cord will be just the thing for the job. It is attached to the end of the socket pull chain as shown, and run through screweyes.—Westy Farmer.

Hot Bulbs Easily Removed With Paper Cone



TO AVOID the danger of burns or shocks when removing light bulbs from electric sockets, a cone made of heavy paper will answer surprisingly well, if employed as shown in the accompanying illustration. The sheet of paper is rolled up as shown and slipped over the end of the bulb, thus permitting a firm grip without danger. The bulb can be easily twisted out in this manner if the bulb is hot enough to scorch the fingers. With portable fixtures it is advisable to grip the frame firmly when twisting.—G. E. Hendrickson.

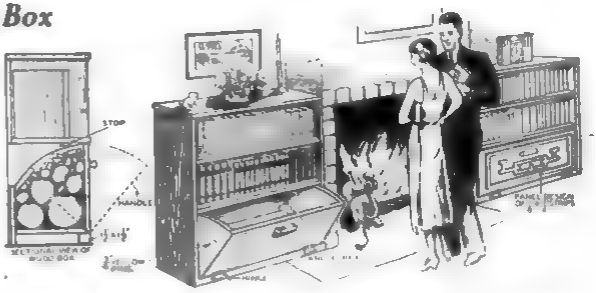
Heating Pad Wrapped Around Water Pipe Thaws Ice, Prevents Freezing

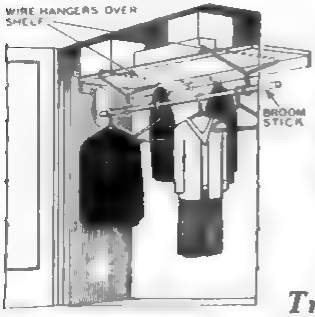
AN ELECTRIC foot warming pad will come in handy this winter, both to prevent pipes from freezing and to thaw them out when they actually freeze. The pad is simply wrapped around the pipe and cord plugged into the light socket as shown in drawing at the left.—Dan Moore.

Ideas for Household Improvements

Built-in Ornamental Wood Box

THE problem of storing fuel conveniently near the fireplace may be solved by constructing a built-in tilting box beneath the bookcase which flanks the fireplace, if your home is arranged that way. The design of the ornamental panel should be in keeping with the other furniture.—Hi Sibley.



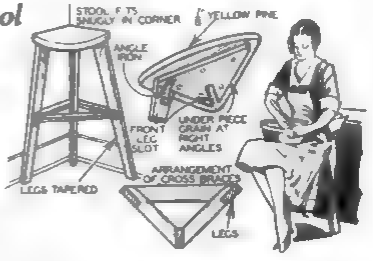


Coat Hanger Racks Increase Closet Capacity

AN EXTRA pair of wire coat hangers slipped over the ends of a closet shelf so as to support a broomstick or other rod as shown in the drawing at the left, makes an effective garment pole hanger and increases the useful closet space. The hangers are first unbent and slipped over the shelf, and then reassembled. The pole is then hung in the hook as illustrated to serve as the rod for the clothes hangers. Such an arrangement will support great weight.—Malcolm Gray.

Triangular Corner Stool

THIS convenient all-round stool is designed on the right-angled plan so that it can be set in the corner against the wall. The seat is of 7/8-inch pine, with a slotted triangular piece underneath to take the legs. The appearance will be improved by tapering the legs, two of which slant outward as illustrated at the right. Cross braces and angle irons make the stool rigid. It can be varnished or left unpainted.—Oscar Boggs.

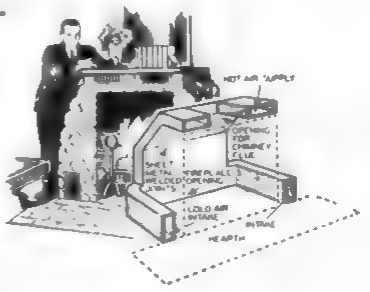


Pop Bottle Caps Screwed to Board Make Cleaner Mat

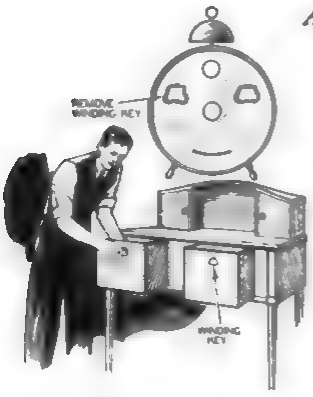
AN EFFICIENT, yet simple and inexpensive, door mat that cleans shoes thoroughly can be made from a number of pop bottle caps and a piece of board about 18 inches by 12 inches. Holes are first punched in the tops of the bottle caps, which are then screwed down flat to the board as illustrated in the accompanying drawing. These caps are set side by side in rows.—Warren Mundis.

Heater Raises Fireplace Capacity

AN INGENIOUS hot air heater can be built into a fireplace to increase the warmth given off by the flames. Built of heavy sheet metal with welded joints, it is shaped as illustrated in the accompanying drawing. Two intake flues carry the cool air from the room up through a hollow fire back and eject warm air out into the room from an opening above the fireplace. It is necessary to set the metal heater in place first, and then build up the fireplace around it.—Bill Doblin.



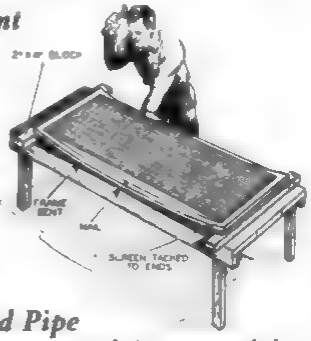
Labor-Saving Workshop Kinks



Alarm Clock Winding Keys for Drawer Handles

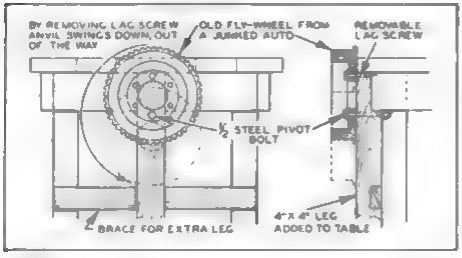
WINDING keys and rings (handles) removed from old alarm clocks will make attractive pulls for small drawers and doors in building radio cabinets and other small cabinet work. It will be necessary to retap the hole in these keys as they are not standard. They can then be fastened to the work with small round head machine screws. Some of these parts are brass while others are nickel plated. When they are polished and lacquered they are equally attractive.—George W. Crooks.

Screen Stretching Stunt



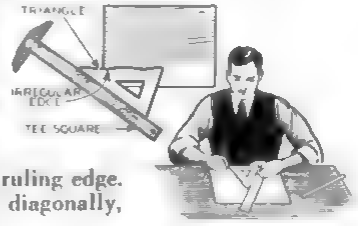
ONE of the annoying problems that often confronts the handyman is the task of stretching the wire cloth on screen frames. The simplest way to overcome this difficulty is to place the frame on a flat work bench and nail it down in the center, placing two wood blocks at the end. Next tack the screening on firmly, drawing it up so that there is no slack. When the frame is allowed to straighten the wire cloth will be tight.—Walter Kately.

Junked Auto Fly-wheel Makes Shop Anvil to Bend Pipe



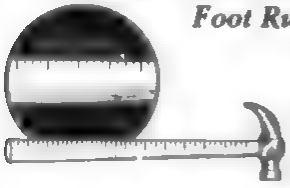
BENDING pipes or rods in your workshop will be a simple and easy job if you rig up the junked auto flywheel on the end of your work bench as illustrated in the accompanying drawing. A 4"x4" extra leg is added to the table and the flywheel secured in place by means of ½" steel pivot bolts. To put the wheel out of the way when not in use, remove one of the lag bolts so that the wheel can be dropped to a lower position on the leg.—James Meissner.

Drafting Kink Produces Fine Wood Graining



ONE of the hardest tasks for a draftsman to perform at a rapid rate and in an even manner is wood graining. Here is a cross hatching wrinkle which will produce fine wood graining rapidly and with an effect of a highly polished wooden surface. An ordinary celluloid triangle is given an irregular contour with a spoke shave, and finished with sandpaper so as to give a good ruling edge. By ruling parallel lines and sliding the instrument down diagonally, fine wood graining can be rapidly done.—George Paul.

Foot Rule Markings on Hammer Save Time in Workshop



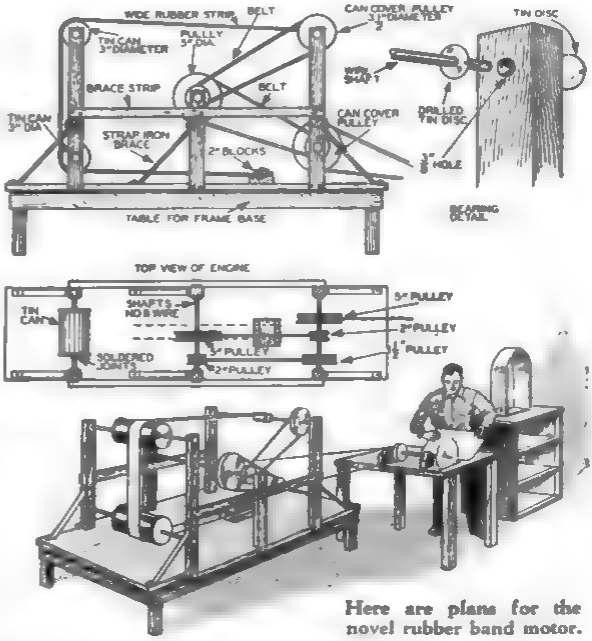
TO MAKE your hammer do duty as a foot rule, mark it off first with a good ruler, then cut out each mark, as illustrated here. Roman numerals may be carved in with a pen knife. The notches for the markings are then blackened with India ink and the handle sandpapered and varnished.—Dr. V. J. Hudson.

Engines to Run Toy Machines

Rubber Band Motor

THERE is more power in a rubber band than you would think. For example, take this novel little motor, which gets its enthusiasm solely from a wide rubber band taken from an old inner tube.

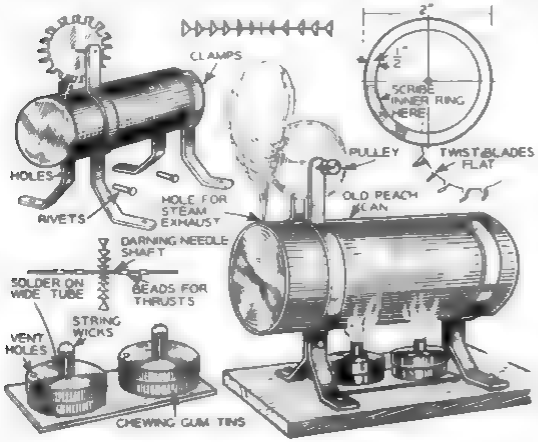
Pulleys are made from old tin cans and gear the machine down to produce steady power. The frame is made from wooden strips which are assembled and secured to a large table as illustrated in the accompanying drawing. Shafts for the pulleys should be located at the points shown and are made from fairly large, stiff wire. The drawing at the right shows how the bearings are constructed. The rubber band is secured to the table by 2-inch blocks as shown and runs up over the two tin can pulleys and finally to the small pulley on the end, where it is fastened. When wound up tightly the rubber band delivers power to the 2-inch pulley, which in turn runs a center wheel. The last wheel is the one in the lower right hand corner, which is belted to whatever machinery you may wish to operate. The rubber band motor will not run continuously, but must be wound up every so often. It provides as economical an engine as you could wish for. —George Smedley.



Here are plans for the novel rubber band motor.

Novel Steam Turbine With Can Boiler Replaces Motor to Run Small Toys

HERE'S another little motor, a steam turbine, that can be made for a few cents by anybody. The boiler is made from an old peach can. First, clean it out thoroughly, then solder on the end a tin disc, making sure that you have water-tight seams.



The boiler is mounted on brass strips, one at the front and another at the back. Considerable care will be required in making the turbine wheel. Take a tin disc and scribe a circle on it one-quarter of an inch from the inside edge, then cut out the blades with a tin snip. Take out every other segment and twist the remaining segments into positions shown in the accompanying drawings. A hole is then punched in the center for the darning needle shaft. The turbine wheel is then mounted on the supports as shown and a hole punched in the end of the can at a point just under the outer blades. Alcohol will make best fuel.—Theo. Allen.

Chemists Make PLANTS

The reflection chamber, showing empty fruit jars, in which tomato plants were grown synthetically. The jars are placed on discs which rotate constantly, giving all parts of the experimental plants the benefit of uniform radiation conditions.

An oat plant grown from a water solution, showing the tendency of the plant to bend towards certain colors in the light.

This tomato was grown without soil. The experiment was the first of a series undertaken by the Smithsonian Institute scientists.

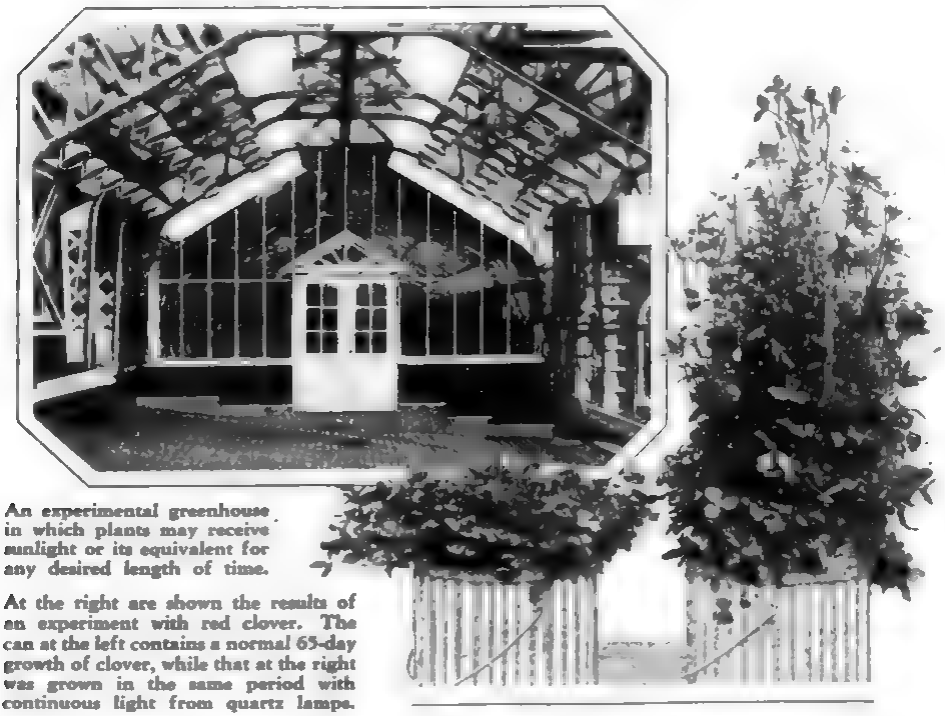
PLANTS, like hens, can be fooled into working overtime. They can be made to think it is spring or fall, and induced to bear flowers and fruit out of season, or even flourish without soil in which to grow. Just as surgeons pep up our bodies by doctoring our glands, so can plant-doctors transform giants into dwarfs and dwarfs into giants. On the threshold of old age, plants can be persuaded to send out fresh, vigorous branches to fruit and flower again.

Some plants blossom and fruit only on a short light day. They are, so to speak, the trade unionists of the plant world. A tomato plant, for instance, wants a long rest every day. Give it twelve hours of light and it increases in stature and fruitfulness. Provide it with a light day of twenty-four hours and it promptly goes on strike. Late flowering dahlias are readily persuaded to flower in mid-summer provided the supply of light is curtailed to less than twelve hours each day.

Under ordinary conditions spinach cannot be successfully grown for table use during the summer months due to the fact that the long hours of daylight accelerate the formation of flowering stems; the plants produce seed instead of the desired rosette of leaves. This state of affairs can be corrected by covering the plants so that they get no more than ten hours of light each day, for then the formation of the flowering stems is greatly delayed.

On the other hand there are many plants which are hard-workers; they are gluttons for light. Spring wheats, oats and barley are just such plants. These cereals have been grown from seed to ripened grain in

Work Overtime



An experimental greenhouse in which plants may receive sunlight or its equivalent for any desired length of time.

At the right are shown the results of an experiment with red clover. The can at the left contains a normal 65-day growth of clover, while that at the right was grown in the same period with continuous light from quartz lamps.

forty-five days by giving them twenty-four hours of light per day. In the same manner it has been possible to speed up sweet peas by five weeks and lettuce by three weeks. Red clover, which usually needs two seasons to mature, has been successfully grown in sixty-five days by giving it a ration of continuous light.

The growing of a tomato without soil—the first accomplishment of its kind in the world, so far as is known—was the first in a series of remarkable tests now being conducted by the Smithsonian Institute of Washington to determine, if possible, the exact relationship of light to living, growing plants. The tomato was grown in artificial light with a chemical solution taking the place of its root soil environment.

Between two moist sheets of blotting paper, were placed a number of tomato seeds. These seeds were kept in their blotting paper beds and subjected to a constant temperature until they sprouted and developed roots. The slender shoots were then inserted carefully through holes made in large cork stoppers that fitted tightly into the mouths of ordinary quart-size fruit jars filled with a solution of nitrates and sulphates—the future food of the plants. The openings in the corks through which the tiny tomato plants were inserted were full stem size in diameter. This precaution, the Smithsonian scientists explain, was taken in order not to choke the "experimentals" as they matured. Cotton packs encircled the slips at the points of passage through the corks, holding them upright and in place.

Once settled in their new homes—their heads out, their roots within—the little plants were prepared for their next great adventure in life—sunlight or its equivalent. To this end they were placed in a chamber and subjected to constant, regulated artificial light. Here they grew to maturity, revolving day by day on discs, so that all parts would come under the same radiation conditions of the reflection chamber.

Aerial Train Demonstrated at the National Glider Meet

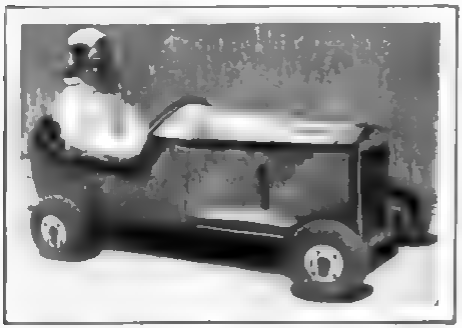
The German Air Train being tested at Roosevelt Field. Note tail wheels which are used to take off.

GERMAN aviators are going Frank Hawks one better by flying aerial trains with two gliders instead of only one. Although towing gliders by plane is not new, the method of rigging the tow line is a novelty. As the photo shows, a "Y" frame has been erected on the fuselage of the plane, and the gliders are flown side by side. The affair was demonstrated at the recent Elmira Glider Meet.

Six-Year-Old Has Midget Racer

MASTER Fred Lee Richardson of Los Angeles has his own ideas about racing, but he says they will keep until he is a little older. He is shown below with his home-spun speedster made for him by his uncle, an airport manager.

Except for the motor, which is a two-cylinder affair taken from a lawn mower, the racer is built up of old airplane parts. Airplane tail wheels are used, while the frame is of aircraft tubing. The body, which is five feet long, is made from old motor cowlings. The tiny gas tank holds one-half gallon and will run the car more than ten hours at a top speed of twenty miles an hour.



Fred Lee Richardson and his tiny auto racer.

Emergency Exit for Airplanes

With this door hinged at the top so that it cannot be blown closed, there is plenty of room for passengers to escape from the plane by parachute.

FROM England comes news of an improvement in exits from cabin planes which greatly increases the chance of escape by parachute when a plane is in danger.

The owner of the plane took off the side hinges and hinged the door at the top. On one side of the door he then added a strong ratchet which would hold the door open. One must release this ratchet before the door can be closed. The door opens easily as there is no wind pressure.

PLANE TALK

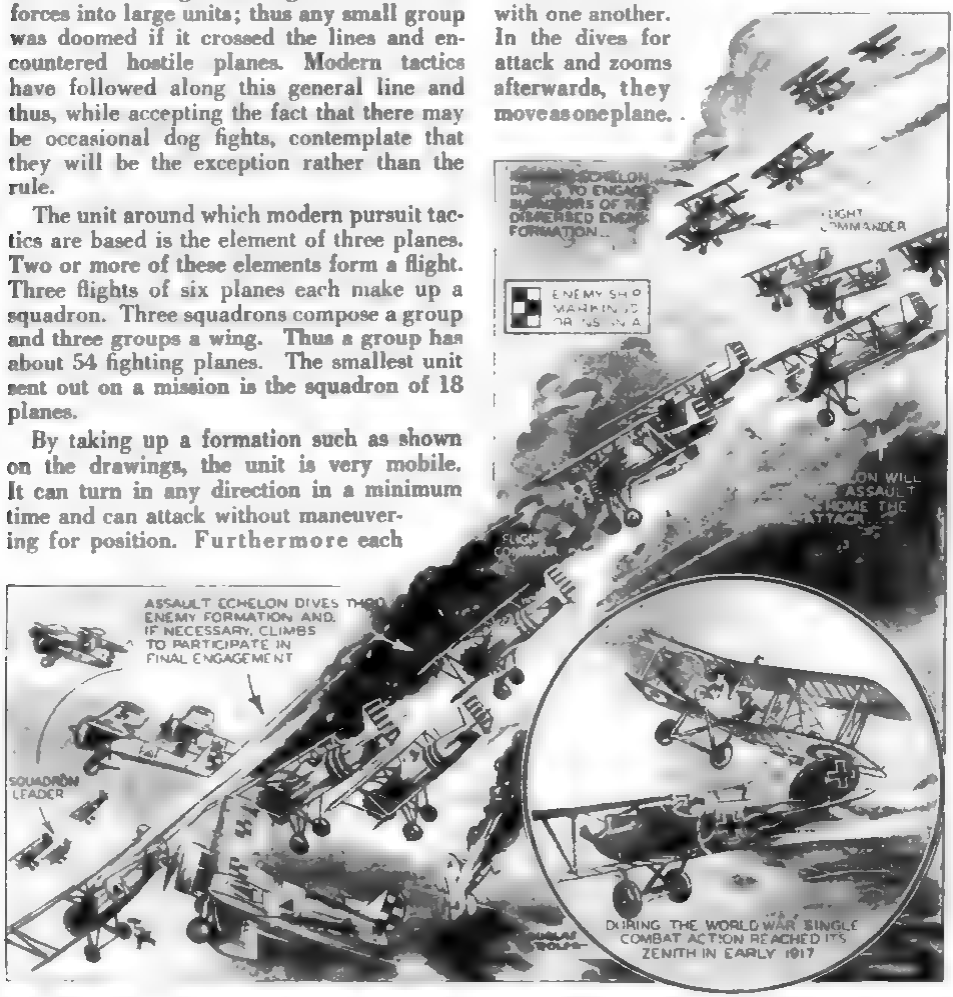
Edited by H. H. ARNOLD

Mass Tactics in AERIAL FIGHTING

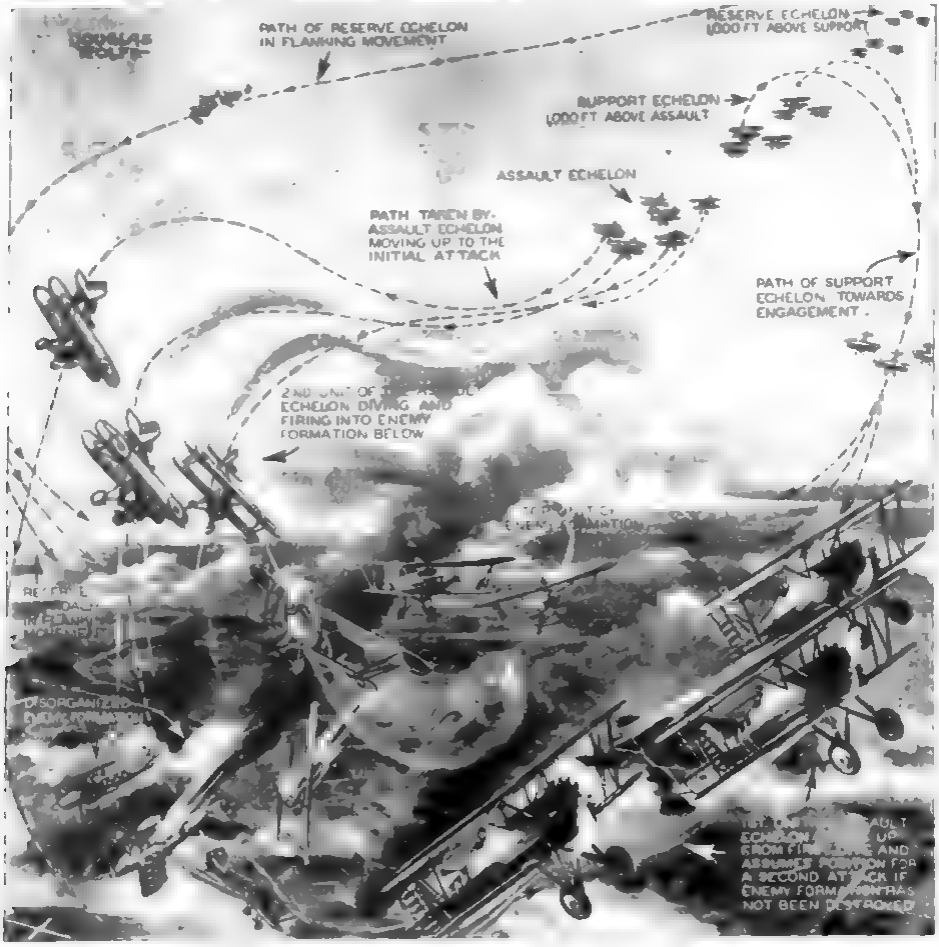
DURING the latter part of the World war it became almost suicidal for a lone airman to go out and hunt for hostile aircraft. All of the belligerents organized their air forces into large units; thus any small group was doomed if it crossed the lines and encountered hostile planes. Modern tactics have followed along this general line and thus, while accepting the fact that there may be occasional dog fights, contemplate that they will be the exception rather than the rule.

The unit around which modern pursuit tactics are based is the element of three planes. Two or more of these elements form a flight. Three flights of six planes each make up a squadron. Three squadrons compose a group and three groups a wing. Thus a group has about 54 fighting planes. The smallest unit sent out on a mission is the squadron of 18 planes.

By taking up a formation such as shown on the drawings, the unit is very mobile. It can turn in any direction in a minimum time and can attack without maneuvering for position. Furthermore each echelon is so placed that it protects the others in case of attack. In any formation the elements of three planes keep their positions with reference with one another. In the dives for attack and zooms afterwards, they move as one plane.



The formation of a squadron during an attack on a group of enemy planes. The assault echelon dives and goes past the enemy aircraft to a position on the other flank ready for another attack. The support echelon dives and starts firing as soon as the attack is clear. The reserve then follows.



This plate shows how the different elements move to their attack position. The assault echelon moves to the right and well above the enemy aircraft and dives with machine guns firing. The support takes its position on the other side and times its attack to immediately follow the assault. The reserve follows.

Fig. 2 shows the method of attack. The assault echelon moves to the right of the enemy and to a position above from which it can dive to the attack. Similarly the support moves to a position to the left. The reserve follows the assault.

When the dispositions are made, the assault dives with engines wide open. The planes increase speed until they are tearing through the air at a speed of 250 or 300 miles an hour. When within 100 yards of the hostile planes, machine gun fire is opened. The assault planes either pass below, go through or pull up above the enemy aircraft and zoom to a position on the opposite flank.

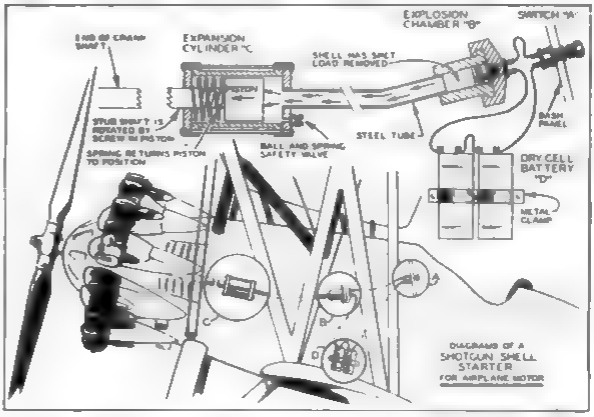
In the meantime the support waits until the assault echelon has driven its attack home, when it starts to dive. The two attacks are so synchronized as to follow each other without interval but with sufficient time for the assault to clear before the support reaches the bottom of the dive. The support then pulls up on the opposite flank, or the one formerly occupied by the assault. The reserve times its attack to follow immediately upon that of the support.

The plan of attack keeps the hostile planes under an almost continuous fire. As long as they maintain their formation, they can put up a good defense but when one of the planes leaves the formation, it will be set upon immediately by several pursuit planes.

Will We Use T.N.T. or Gunpowder as Fuel for Engines?

SOME time ago a new engine starter appeared which utilized a shell similar to an ordinary shot gun shell to furnish the power for turning over the engine. The details of this starter are shown in the accompanying sketch. The shell is placed in a firing chamber in the pilot's cockpit. It is fired by electricity.

A safety is provided to take care of any excess pressure in the cylinder. The starter is light in weight and the shells convenient to handle. As far as can be determined the gases formed by the explosion have no ill effects upon the piston.



A detail drawing showing the method of operation of the shot gun shell engine starter. After use the starter disengages and a spring returns the piston to its normal position.

The next logical step along this line is the engine which runs on T.N.T. or gunpowder. The saving in weight of fuel of such an engine would be tremendous. A small pinch would be enough for each cylinder charge. The explosive danger could be eliminated by using materials which could be ignited only by a special fuse or electric plug. The mechanical difficulties may be many but the shot gun shell starter seems to bring the T. N. T. engine to a point just around the corner.

Gasoline Engine Airplane Model

DURING the contests of the Airplane Model League at Dayton, a gasoline engine model appeared on the field. The owner and builder of the model, Carl Carlson of Chicago, Ill., bought the engine and built the plane. The model has the following dimensions:

Length	9′ 6″
Span	10′ 11″
Chord	1′ 6″
Weight, complete	9 lbs.

The engine was hand made, single cylinder, air cooled, two cycle and developed ½ H. P. at 3000 R.P.M. The engine weighed three pounds complete with all of its accessories. It secured its electrical current for ignition from a flash light battery. The gas tank was made from a tobacco can and held one-half pint.

In the above photo the engine is running and the owner of the model is making minor adjustments prior to sending the ship on a flight at Wright Field. The model took off successfully several times from a canvas runway for short flights.

The photo at the right gives a good idea as to the size of the gasoline motor driven model airplane. Note the tiny air-cooled cylinder and the small gasoline tank just in front of the upper wing.

MILLIONS in JUNK

The Flying Junkman, Arrigo Balboni, of Los Angeles, provides a haven for airplanes that have flown their last mile. His "Graveyard of the Skies" provides equipment for schools, home airplane builders, and even the larger air lines.

A scrap metal heap at the Charleston Navy Yard. The Navy Department employs an expert in scrap metal who each year saves the government many millions of dollars.

Old, broken baskets are either repaired or pulled apart to make cheaper ones.

A wholesale junkshop piled to the ceiling with old magazines to be sorted and graded according to the quality of the paper.

and Waste Material

Old rubber tires are specialized in by some junk dealers. The rubber thus obtained is used in making articles which do not require a very high quality of new rubber.

Burlap bags unfit for use as such are cut up and made into potato barrel covers.

Even old and decrepit barrels have their uses. Some are dismantled and used for coopering other barrels.

Old pipe and fittings from buildings that are being torn down are a source of revenue for the junk dealer.

FUN and Profits from

This air rifle shooting gallery has all types of targets found in regular gallery. Set up out of doors, or in the basement of your home, it will yield surprising profits from amateur marksmen customers.

by DALE VAN HORN

Simply by investing a small amount of cash and effort in this air rifle shooting gallery, you can easily earn as high as $35 a week. The targets are easy to make and operating cost is negligible, so that all earnings are almost clear profit. Five different targets will prove attractive for the amateur marksmen who patronize your rifle gallery.

Fig. 1. Pulley which connects to drive shaft to operate rabbits is assembled as shown above. In Fig. 2, at right, is seen rear view of gallery. Motor on floor board is connected by belt to reducing pulley, which in turn operates pulley turning the rabbits. At top is the swinging target pulley.

MOST of us can't pass a shooting gallery at a fair or carnival without a desire to stop and pop the ducks. Yet the quarter involved lasts but a moment and after the first round we want to do it again.

So let's make a gallery for the basement, get a good air gun and have some fun. Or, going a step further, you can set this gallery up in your barber shop or pool room, or any vacant spot and make some money. F'rinstance: A handy Iowa man rigged up some moving ducks in the back of his barber shop, bought a 50 shot repeating air rifle and took in an average of $35 a week from this one source alone, in a town of less than 1,000 population.

The shooting gallery shown herewith is substantially built and if the chance and de-

this Air Rifle Gallery

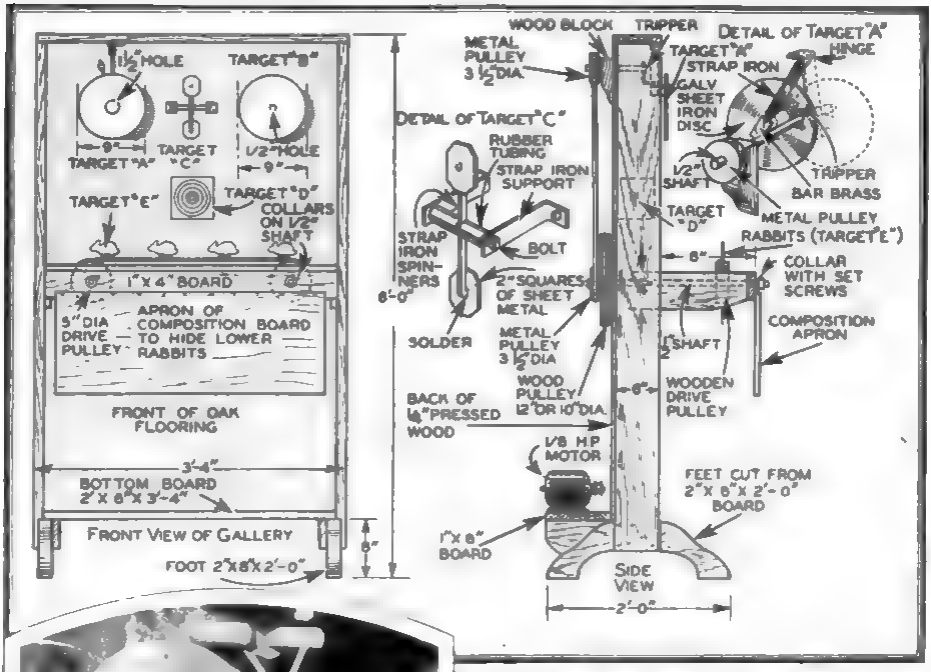


Fig. 4. Complete plans for frame and individual targets of gallery are given above. Note locations of targets on front, and manner in which they are operated. Target "D" is held in aluminum frame.

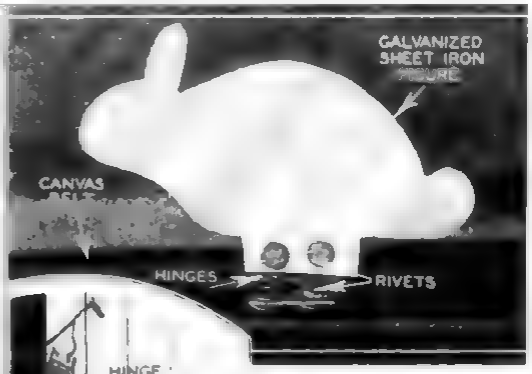
Fig. 3. The double wooden pulley which reduces motor speed for the rabbit target is turned out on a lathe as shown here. The large pulley is 6½ inches in diameter, the small one 1½ inches.

sire permit, you can install it in a nice paying position. In either capacity it will be well worth the $15 or so that you will probably invest in belting, pulleys, wood and motor.

Referring to the plans (Fig. 4) we have a frame of 2 by 6 inch material standing about 6 feet, 3 inches above the floor. It is 40 inches wide and the back is covered with ¼ inch thick pressed wood, heavy galvanized iron, or oak flooring. The supporting feet are cut as illustrated, the design being traced, then cut out on the band saw. Five inches of the lower ends of the frame are nailed to this, one half their thickness being chiseled away. Two arms or brackets are nailed to these legs, on the inside, to support a 1 by 8 inch board behind, upon which the motor rests.

About half way between top and bottom, nail the two shaped arms to the inside of the front of the frame, extending out 8 inches and tied in front and back with a 1 by 4 inch board. These boards were provided with ½ inch holes, 5 inches from the ends and they become bearings for the shafts which operate the rabbits. The pulleys operating the rabbit belt are turned on the lathe and the rim slightly rounded. The ideal way to key these to the shaft is to get floor flanges with set screw and screw holes so that they can be threaded on the shaft, fastened with

Fig. 5. Pulleys which turn canvas belt holding rabbits are mounted on shafts with floor flanges as shown here. Front of board serves as bearing, while the collar prevents play.



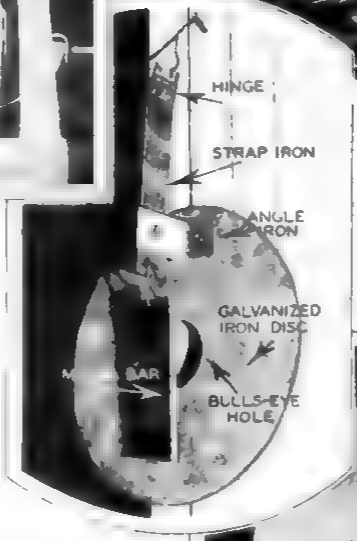


Fig. 6. Galvanized sheet iron figure of rabbit is attached to canvas belt by means of hinge, which permits rabbit to fall when struck. Fig. 7, at left, shows swinging target (Target A). Tripper striking strap iron holder swings disc back and forth. Metal bar is behind bull's-eye.

screws to the pulleys and then keyed to the shaft, as illustrated in Fig. 4.

The rear ends of these shafts, shown in Fig. 2, are equipped as follows: A wooden pulley, shown in Fig. 3, was turned on the lathe having two grooves for the shaft directly over the motor. One groove was 6½ inches in diameter, the other 1½ inches in diameter. This was slipped over the shaft loose and a collar put on the end and set. This pulley is to reduce the motor speed down to a usable gait for the rabbits.

On the other shaft a 10 inch diameter grooved pulley was turned from wood, a small 3½ inch diameter metal pulley being fastened to this with screws as illustrated in Fig. 1. This pulley has a set screw, thus permitting the locking of both to the shaft and becomes the drive pulley. In use, round belts connect these various pulleys. The small metal pulley on the driveshaft is connected to another 3½ inch pulley above which operates the swinging target.

Note that, as illustrated in Fig. 4, this pulley shaft runs through a wood block which is nailed in place to the rear of the target, just back of the swinging target (Target "A"). The front end of the shaft was

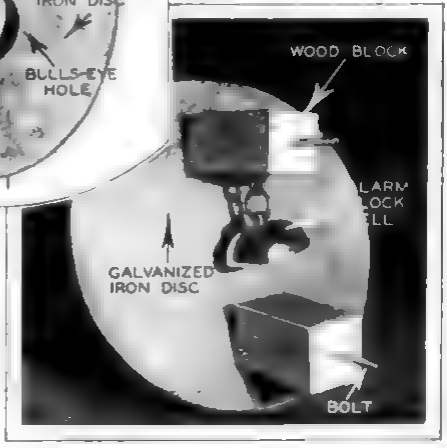


Fig. 8. Stationary target (Target B) is mounted on rear by means of bolts running through wood blocks, which support alarm clock bull's-eye bell.

drilled and a 3/16 inch bolt, 6 inches long, was put through with a nut on each side and tightened. Then the end of the bolt was bent over at right angles. As this tripper swings around, it strikes the strap iron supporting the swinging target.

The detail photo (Fig. 7) shows how a short piece of light strap iron is fastened with small bolts to the back of the target by

(Continued on page 182)

MONEY-MAKING IDEAS FOR WORKSHOP FANS

Earn Big Profits Selling "Pigs-in-the-Pen" Trick Boxes

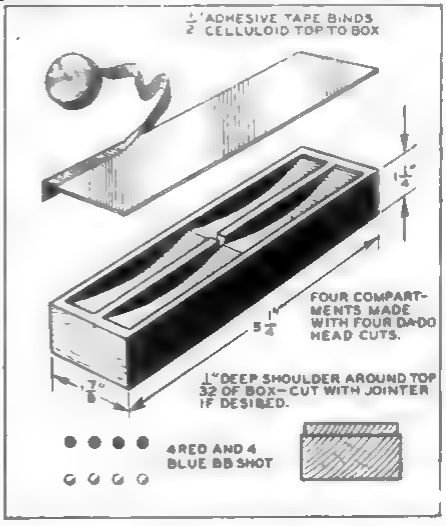
THESE new "Pigs-in-the-Pen" trick boxes, are so made that they can be turned out in large quantities to net a nice profit to the maker when they are retailed as novelties through stores at 25 cents each. Requiring but a single piece of wood, a sheet of celluloid, 8 BB shot and enough tape to bind the celluloid top in place, the cost for materials will not exceed 3 cents each. Thus a nice margin of profit results when the trick boxes are sold to the dealer at 15 cents or $2.00 the dozen.

To make the box cut a block of wood (it may be white pine, sap gum or maple or birch) to dimensions given in the accompanying drawing. Cut the four compartments ⅝ inch wide and with a partition between them ⅛ inch thick. The side walls should be ¼ inch thick. The cuts should start about ½ inch from each end and overlap in the middle about ¼ inch below the box top. This will permit the shot to roll over this high spot on either side. Then with your knife, make a "V" shaped cut through the partition at the exact center down to these raised ridges as shown so that shot may pass from one side to the other.

Object of the fascinating trick is to work BB's over into other compartment.

The sheet celluloid is cut to the same dimensions as the top of the box and held in place with adhesive tape or other adhesive strip of paper to suit. Before this top is fastened on, however, 8 BB shot must be painted and put inside. Lay them on a sheet of screen and wipe with a brush dipped sparingly in the red or blue paint. Lacquer is best since it will dry in a few moments. Four shot should be blue and four red. Finally a stain or paint of some bright, attractive color should be applied to the outside of the box and allowed to dry.

The object of the trick is this: Start with all 8 shot in one of the compartments. Then work one shot of each color in each compartment. That's all there is to it. But, provokingly, the shot or pigs will not always do as the operator wishes, and to say that the stunt is tantalizing is putting it mildly.



Drawings above illustrate construction and assembly of the box. Four compartments are cut with dado head and covered with celluloid sheet held in place by length of common adhesive tape.

Cattalo—A New Animal from the North

Photo above shows small herd of buffalo, a fast-vanishing animal, which animal husbandmen of the Canadian Dept. of Agriculture are attempting to cross breed with the domestic Hereford cow. If successful the experiment will convert the Arctic prairies into profitable feeding grounds.

At left is shown a young "Cattalo," result of cross breeding of buffalo and Hereford cow. Recent tests show that meat is equal in quality to beef.

Here are hybrids with their progeny at National Park, Alberta.

"CATTALO steak, sir? Nice and tender today." You may hear that in dining-cars and hotels in the near future.

The "cattalo" is the result of crossing the buffalo and Hereford cow, and has been bred by the animal husbandmen of the Canadian Department of Agriculture with a view to transforming the Arctic prairies into a profitable ranch. Blessed with the hide of the buffalo, this new animal is capable of rustling for a living in the most severe climates. At the same time it inherits the docility of the domestic cow and can be easily herded. Recent tests show that the meat is equal, both in quality and texture, to the finest beef. To overcome sterility, the Yak, of Tibet, was introduced into the breeding experiments. For years the male hybrids have evidenced the violence of the first cross by being sterile, but persistent cross-breeding has overcome this difficulty.

Electric Eye Regulates Furnace

THE "electric eye" now turns to the furnace to see that it doesn't get too hot. The photo tube is focused on the furnace wall or some object in the furnace and takes its cue directly from the brightness of the heated surface. When the desired limit is reached, the same current which has been recording the temperature rise operates a thyratron tube which controls the supply of fuel or electricity. Another tube is utilized to turn the heat on again when the furnace cools.

Detachable Wheels Convert Roller Coaster Into Snow Sled

WHETHER it's summer or winter, a new scooter now being marketed will provide plenty of amusement. In summer it's a three-wheeled scooter and in winter it's a coaster. This transformation is effected by removing the wheels on the "wings", leaving the runners exposed for some plain and fancy coasting. Stability is afforded by the wide balancing runners, as illustrated at the right. A large center board has adequate room for one or two passengers.

At top is shown sled with wheels removed for winter coasting. Below—Sled equipped with rollers.

Science Solves Mystery of Thrills

WHAT people call thrills are among the commonest experiences of life, yet no scientist knows exactly what they are. The commonest description that one gets from individuals is that the so-called thrill is accompanied by a tingling sensation up and down the back. Most people report that they feel more active and energetic immediately afterward.

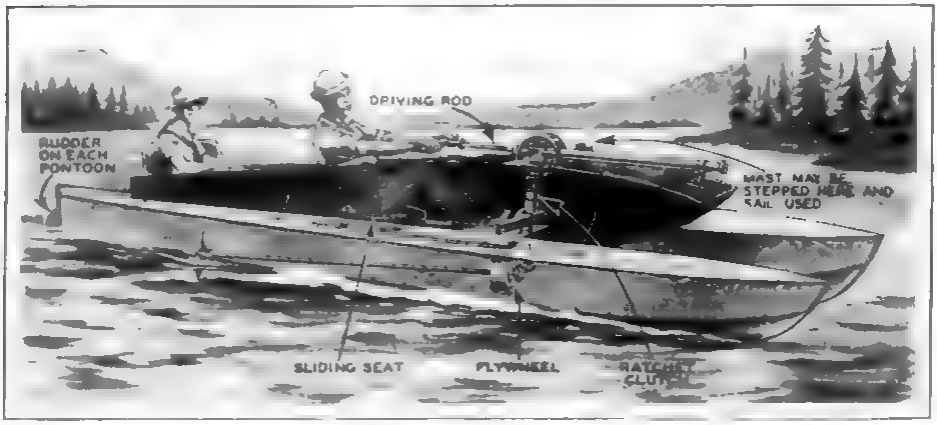
The whole theory of modern amusements rests on the attempt to create this special nerve sensation. Some experts believe that all nerve actions, including thrills, are sudden electric discharges in the nerves, something like the explosion of a train of gunpowder. The kind of nerve and brain action which we call reason is confined to mankind, although many animals such as elephants possess intelligence.

Traffic Signs Controlled by Cars

TO EXPEDITE traffic movement, Chicago has installed an "Electromatic Control" system whereby automobiles approaching a street intersection automatically regulate the stop-go lights. Each car registers on the control box through street contacts.

At right above is the street switch operated by auto wheels as the car approaches the intersection. Connected through control box at the left, the switch automatically turns stop sign to "Go," thus expediting traffic movement at busy street intersections.

Catamaran Propelled by Either Sail, Motor or Hand Power



A phantom view of the boat, showing the rowing mechanism. The mast may be stepped in a few minutes.

Stocking Protector of Rubber

MADE of thin, transparent rubber, a new stocking protector offers to women an inconspicuous means of keeping their hosiery spotless in rainy weather.

The invisible rubber stocking protects hosiery.

A NEW type of boat has three forms of propulsion—manual, sail and power—and thus offers a means of getting over the water regardless of weather or other conditions.

Another unique feature of design is the craft's two pontoons, sixteen feet long, each containing four airtight compartments that give great buoyancy and seaworthiness to the boat. These pontoons are placed side by side, separated by a roomy cock-pit, at the rear of which is placed a comfortable cushioned seat. Forward of this is the sliding seat for the operator, who pulls out the driving rod as an oarsman pulls his oar. The driving rod is geared to a vertical shaft which runs through the bottom of the boat to the propeller.

At the completion of the stroke, the rod is released through a clutch action and is returned to its original position, a governing flywheel meanwhile keeping the propeller in motion till the next stroke.

The craft is an ideal boat in which to learn to sail, for it cannot list over or capsize even under unintentional abuse. The 22-foot mast carries a triangular and jib-headed sail that moves upon a track along the mast. The propeller, which is protected by a skeg, is not left to drag when sailing but can be raised between the pontoons until it clears the water.

Another feature of design is that when rock or shoal is encountered, the propeller and skeg automatically slide up over the obstruction and are undamaged.

SPARKS from the RADIO EDITOR

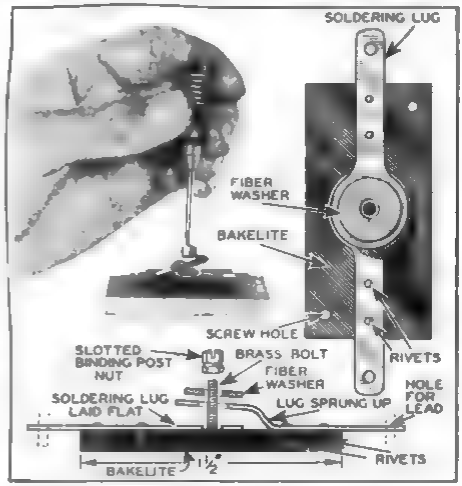
Edited by L. B. ROBBINS

HOME-MADE Neutralizing Condenser

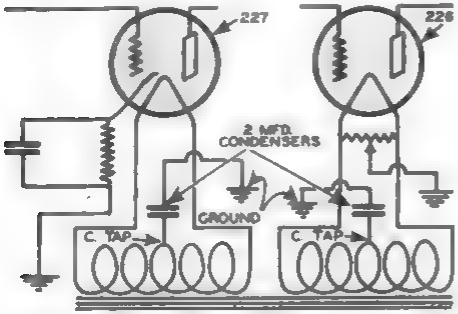
THE neutralizing condenser is necessary in push pull circuits, and can also be used as gang condenser trimmers and balancers in multituned circuits. They also have their place in certain transmitting circuits. Such small condensers can be easily made from scrap parts in short time and will do the work just as well as the manufactured kind. This home-made one works nicely.

The base is a piece of bakelite 1½ inch long by 1 inch wide. Drill a hole through the center and countersink it from the bottom. Then insert a brass bolt and secure it with a small, flat lock nut on the top surface of the bakelite. Drill a hole in each corner of the base for fastening screws or bolts.

The plates consist of two large-sized soldering lugs with holes considerably larger than the size of the upright bolt. Center one flat on the bakelite so the hole clears the bolt and rivet it in place with two cut-off common pins. Then bend the second lug at the shank so it stands away from the base at an angle and rivet this to the base also. The diagram shows this arrangement clearly. Place a fibre washer over the top lug and thread a slotted nut down the bolt over it. Solder the leads to the ends of the lugs. The change in capacity is made by screwing down or up on the nut, thus closing the space between the plates. Shunted across a large condenser it will take up slack very efficiently.



Condenser plates are arranged on bakelite base as illustrated here. Adjustments are made with screwdriver, raising or lowering plate as shown.



Volume may be increased by inserting 2 mfd. condensers in circuits at points shown in drawing.

Efficiency From Socket Antenna

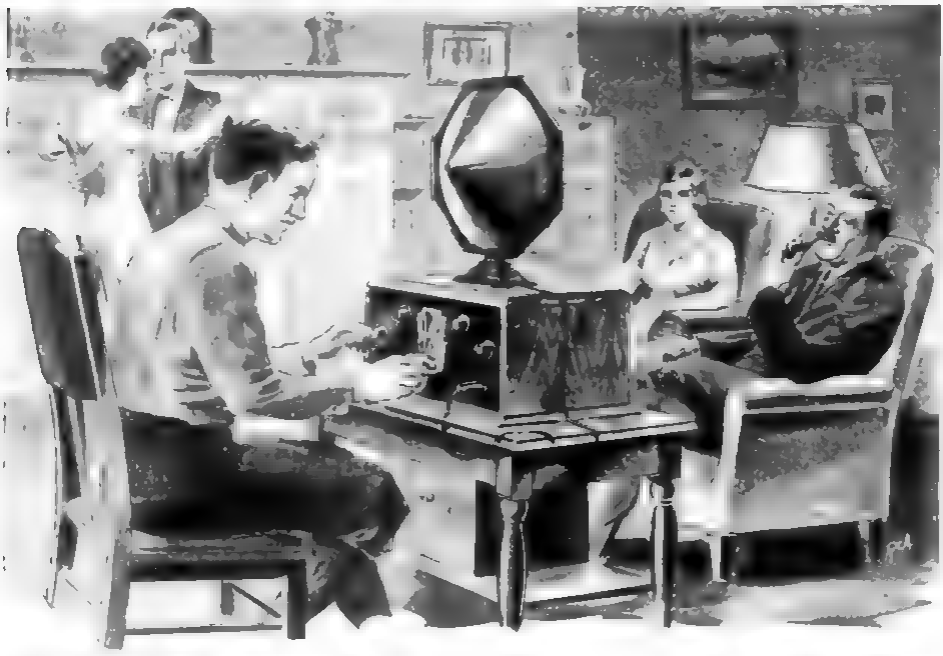
FOR best results with your light socket antenna try the various binding posts for the best combination. It is also advisable to shift the plug to other sockets in the room to locate the one which gives best receiver volume. Also try reversing pronga.

Increasing Volume of A. C. Sets

IN MANY sets using A.C. tubes, especially the 227's, the center tap on the filament transformer is not connected. The winding acts, to some degree, as an audio frequency choke, resulting in a considerable loss of volume.

This choking effect may be overcome by inserting a two microfarad condenser between the center tap and the ground as illustrated in the accompanying drawing. This condenser allows the audio frequency currents to return to the ground or B, thus giving a surprising increase in volume and sensitivity

Battery Receiver Brings in



The receiver has fine appearance and furnishes enough volume to speaker to entertain entire family.

by **L. B. ROBBINS**

FOR some reason the battery type broadcast receiver has been somewhat neglected of late and the person living in isolated districts not supplied with electric lighting current is "out of luck" when it comes to using the modern AC receiver. It is for this person that the broadcast receiver illustrated and described in these pages is intended.

While using only four tubes it will be found to give excellent volume and be as selective as many of the more imposing AC sets. Moreover, it employs the new 2 volt battery tubes of the "30" type so that even a storage battery need not be used. A bank of dry cells, arranged in proper hookup, will operate these tubes nicely over quite a long period. While a maximum of 135 volts of "B" battery is used, there is power output enough to operate a magnetic speaker at practically full volume without the least distortion.

For the reason that many builders will use parts they already possess in assembling this receiver, many measurements will necessarily have to be suggested rather than specified. Yet, by following the general layout, and using one's own ingenuity, no trouble should be experienced in building up a nice looking job and one that will operate with entire satisfaction.

Use any suitable board for the baseboard and cut it about 18 inches long by 7 or 8 inches wide, as illustrated in Fig. 1. Either width should prove satisfactory. For the panel, use hard rubber bakelite, or other panel material. This can be 18 by 7 inches, and is screwed direct to the front edge of the baseboard. Now for the parts used and their placing.

The layout of the parts on the baseboard and on the panel is given in Fig. 1. At the left rear edge of the baseboard fasten two spring battery clips or binding posts. Mark the front one *Ground* and the rear one *Antenna*. Then along the rear edge place four UX sockets about as shown, spacing the first

Good VOLUME on SPEAKER

You can't beat this battery receiver when it comes to efficiency, simplicity, and economy. It is designed especially for use where lighting current is not available and brings in programs loud and clear.

Fig. 1. Parts for battery receiver are arranged on panel and baseboard as illustrated here. Connections are made through Fahnestock clips on side. After set is adjusted, tuning is done with tuning dial.

one farther from the rest. This is for the screen-grid tube. Between the 1st and 2nd socket, or along the side of the baseboard, place seven more binding posts or clips, marking them as follows from left to right: A—, B— and C plus, A plus, C— 1½ to 4½, C— 22½, B plus 67½, B plus 90, B plus 135. Then between the detector and first audio socket place the first audio transformer, and place the second audio transformer between the two audio sockets, as shown.

The filament fixed resistors should be placed in relation to the sockets as indicated. It will be noted that two 230 resistors are placed in parallel to control the detector and first audio tubes, that a 231 resistor is used for the 231 second audio tube, and a 230, for the 230 radio frequency tube. The 230 tube grid leak is placed on the baseboard, and the screen grid rheostat and the variable resistor is operated through the panel. The fixed condensers are all arranged on the baseboard.

The two tuning condensers are each of .0005 mfd. capacity and are arranged in gang to operate from a single drum dial. If of the "bathtub" variety, it will be of advantage because of the extra shielding. At any rate, procure a make that has the rotors connected and one that will allow adjustment of these rotors with relation to each other on the same shaft to which is attached the drum dial.

When the plates of each rotor are completely meshed the dial should read 100 (or the highest reading) and when the plates of these condensers are completely separated the dial reading should be zero. Arrange these condensers so the dial or drum will come in the center of the panel, and of course cut the panel to accommodate it and then fit on the escutcheon.

Two smaller midget condensers of .00005 mfd. capacity are then used for a trimmer and regeneration control, and one is operated through each end of the panel. The filament switch is the last item to be attached to the

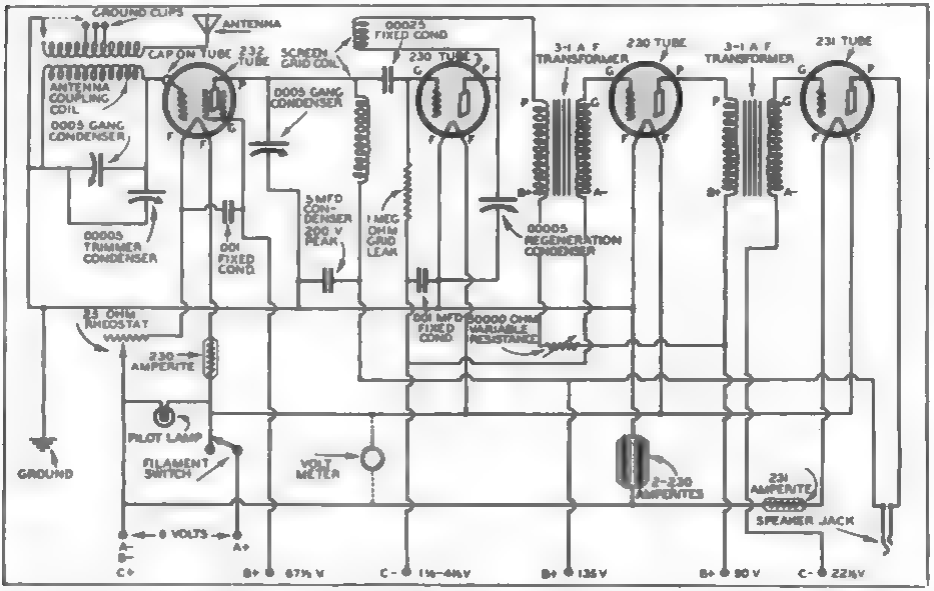


Fig. 2. The battery operated receiver is using, hooked up, the wiring diagram above. Adjustment of ground clip on antenna coupling coil depends upon size of aerial. One of .0005 gang condensers is hooked across secondary of antenna coupling coil; other ganged condenser is hooked in plate circuit of screen grid tube.

panel and can go close to the rheostat very nicely. When the panel is in place and equipped it will look something as Fig. 2. A single circuit jack for the speaker output can go under the regeneration condenser without crowding.

The operation of this receiver depends greatly upon the antenna and screen grid coils. In this case Hammerlund coils were chosen because of their favorable characteristics and reliability. The antenna coupling coil is style AC—23, while the screen grid coil is style SGT—23. As the circuit is designed for these two coils no others should be used.

If the dial provides a socket for a dial light, wire it as shown in Figs. 2 and 3, using a six volt bulb. The voltmeter is not necessary where fixed resistors are used, but in case one is desired in the circuit to keep check of the filament lighting battery, it can be inserted as shown. A meter with an internal switch is best so that the needle will show readings only when the button is pressed. Arrange the two coils at either end of the baseboard as shown in Fig. 1.

In hooking up this receiver follow the wiring diagrams given in Figs. 2 and 3. Do not try to make right angle bends, etc., and do *not* follow the lines shown in the wiring diagram. That is only to show runs and connections as clearly as possible. In practice, make all connections by the shortest route possible, crossing wires at any angle necessary and making the shortest connections between two points. Use flexible rubber covered hook-up wire if possible, as it is much to be preferred to bus-bar or spaghetti and bare wire.

The dotted lines in the diagram in Fig. 3 show the main filament circuit wiring, the thick lines indicate the power supply wiring, and the remaining lines indicate all other wiring necessary to the circuit. By using wire with red, blue and black insulation the wiring of this receiver can be greatly simplified, and the colors will also be of assistance in tracing down trouble at some later date. Use care in soldering joints and use only the best solder.

No cabinet is shown here, as the builder can fit this receiver into most any standard cabinet with but little trouble. The panel is of standard size.

The antenna coupling coil has two separate coils. The outside coil is connected to antenna and ground at each end, but if the antenna is extra long or short, then one of

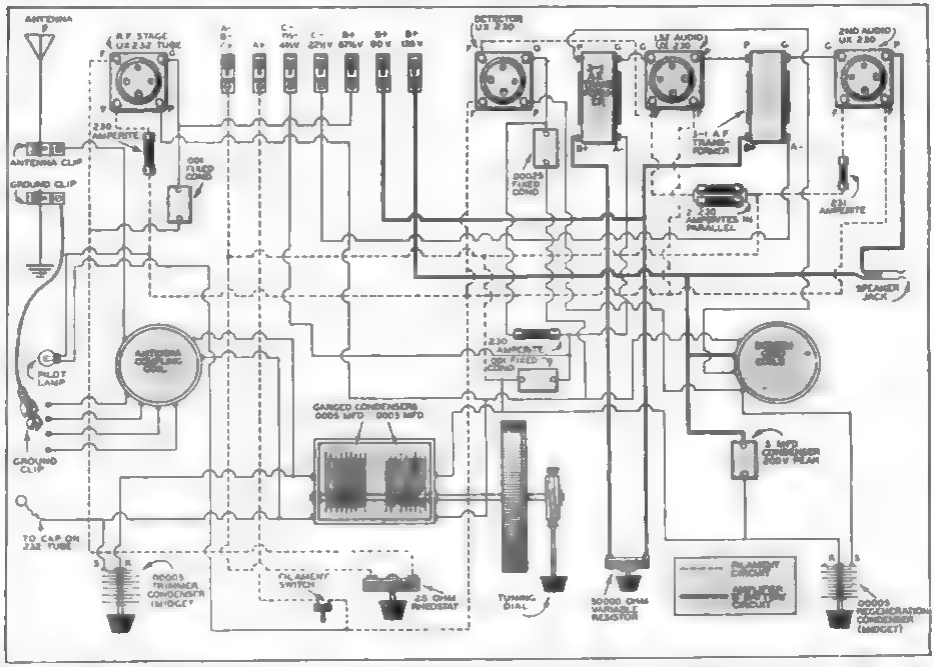


Fig. 3. Here is wiring diagram of receiver, showing layout of parts on baseboard and panel. Use flexible rubber covered hook-up wire, making all connections as straight and short as possible. For wiring convenience, use wire with red insulation for filament circuit, blue for amplifier battery circuit.

the three taps can be used for the ground connection to gain the best balance. The larger winding is the secondary and connects across one of the .0005 tuning condensers. With the screen-grid coils, the larger one is the primary and tunes across the second .0005 condenser, while the small coil is the secondary or "tickler". Connections are plainly marked on each set of coils.

The tubes used are one 232 type for the screen-grid stage, one 230 in the detector, one 230 in the first audio, and one 231 power tube in the second audio. These tubes are very sensitive to filament voltage; taking but two volts to light the filaments. Do not use more than the specified plate voltage on any of these tubes, 135 on the 231 being the maximum for that type tube, and 90 for the 230 and 232 types.

As the plate consumption is but .23 milliamperes for all four tubes, the "B" batteries can be of the small or portable type, although the heavier style batteries will of course give longer life. The "A" battery supply can be of the usual storage battery (6 volt) or a number of dry cells hooked up in series-parallel for six volt output. When the voltage with either method drops to 5½ volts, the storage battery should be recharged or the dry cells renewed. "C" batteries are of the usual small 4½ volt type, and 22½ volt portable.

The detector plate resistor may have to be experimented with slightly and values ranging from .1 to 1 meg. tried until the best detector operation is obtained. Also the various "C" bias voltages to the screen-grid and detector tube should be adjusted until the proper voltage is obtained to produce a well balanced operation.

Any type antenna can be used—light socket, short or long outdoor antenna or wall tape. This will mean using one or the other of the extra taps on the primary to secure best balance. Remember that while this receiver is an excellent one, much depends upon the first adjustments as outlined according to antenna used, ground connections, "C" biases and trimmer and regeneration condenser settings. After these are found the set is practically one dial control. Its quality is excellent, it is very stable and if an external supply is obtainable for the field current, it will operate a dynamic speaker.

Land-Going Sailboat Does Duty as Information Bureau

The last word in advertising stunts—a sailboat on wheels.

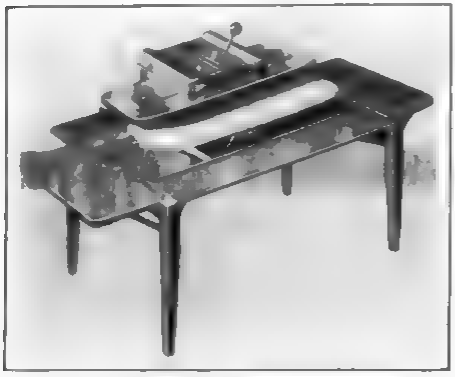
TO AN enterprising hotel man in Salem, Mass., goes the honor of thinking up about as clever an advertising stunt as has ever been devised. His stunt consists of a 14-foot sailboat which has been mounted on an automobile chassis, replacing the regular body. Driven by a young man in uniform, it travels about New England roads acting as an automobile information bureau for the benefit of tourists.

At night the car is illuminated along the sides of the body, while a flood light illuminates the sails. The vehicle has travelled thousands of miles and the driver estimates he has answered 999,999 questions.

Electric Ironer and Table in One

AN ENTIRELY new type of ironer, so simple in operation that a child can work it, has recently been introduced by manufacturers. The ironing unit is permanently mounted in a table which has a removable white porcelain acid-proof top. In front there is a lap board which keeps the damp clothes from resting on the operator's lap, the entire process being carried on from the seat.

The aluminum shoe forming the upper plate is heated by two Calrod elements, each of which is individually controlled by a thermostat. The thermostat dials are marked "High," "Medium" and "Low," to insure proper heat for all types and weights of material. The ironer can be converted into a kitchen table.



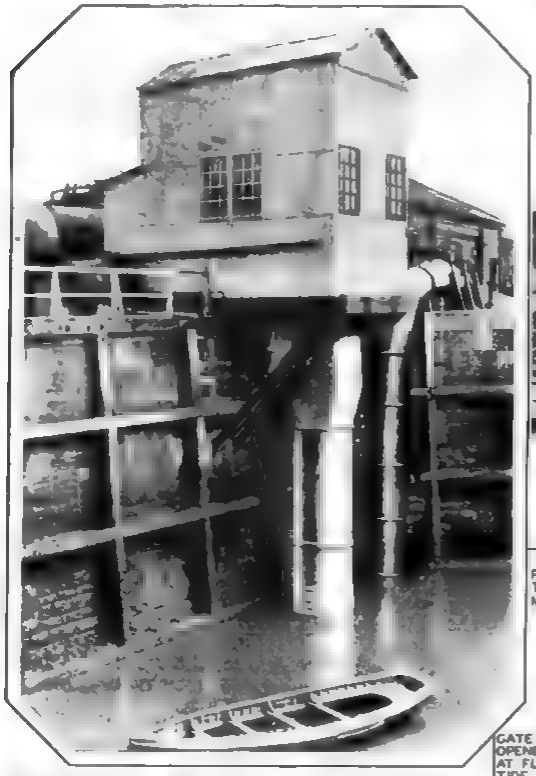
The new electrically operated "Flatplate" ironer.

Lawn Sweeper Does 5 Men's Work

Lawns may be swept clean in minimum time with mechanical rake, which does work of five men.

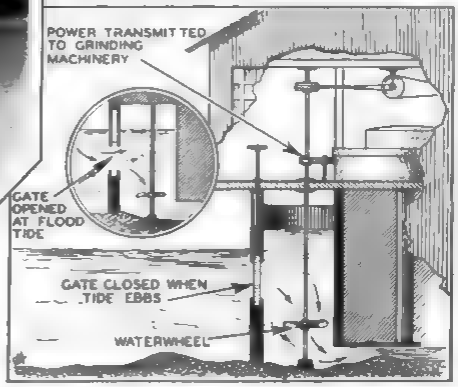
THE task of sweeping a lawn clear of all dead grass, leaves, litter, etc., is made easy with a lawn sweeping machine now being marketed. Closely resembling the conventional lawn mower, it does the work of five men with rakes, and is thus ideal for large plots of greensward such as is found in parks, cemeteries and golf courses. Grass and leaves are swept into a large removable canvas receptacle, as shown in the photo above. Chief among the commendable features of this sweeper is its disinclination to injure the turf, a feature not found in its manually operated relative, the rake.

Tide MILLS Harness POWER of Ocean



This Slade Tide Mill, of more modern origin, located at Chelsea, Massachusetts, serves as both grist mill and electric station. Note discharge pipe.

Built in 1867, tide mill shown above, located at South Harpswell, Maine, ground corn till 1885, when it was wrecked by a storm.



Drawing here illustrates construction and operation of tide mill. Water from dam passing through water wheel compartment operates grinding machinery. Length of grinding period is four hours.

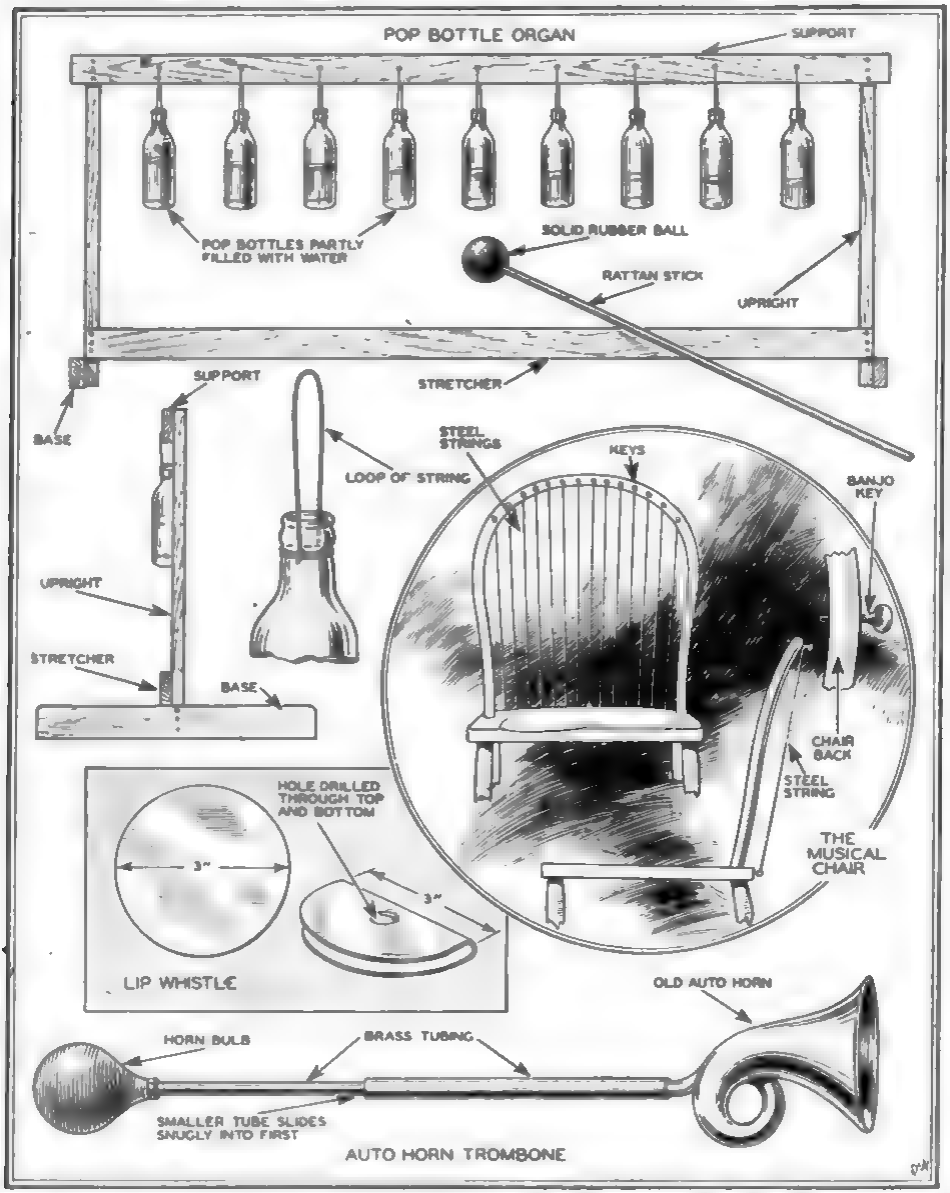
IN THE days before steam, gasoline, or electricity, the early settlers along the North Atlantic coast watched the rise and fall of the tides and perceived that here was a lot of energy going to waste. The result was the erection of many tide mills which harnessed the rising and falling water to grind the farmers' grain.

The prime requisite for a tide mill was a natural basin or reservoir with a narrow outlet that could be dammed easily. There the mill was located. When flood tide filled the storage pond the gates at the sluiceway in the dam were closed. This gave a head of water, depending on the height of the tide, ranging usually between 8 and 24 feet.

On the ebb, when the outside waters had receded below the dam, gates were opened from the mill floor, sluicing the water on the wooden paddle wheels or on the buckets of turbine wheels turning on a vertical axis. By means of pulleys and gears, power was transmitted to the grinding machinery, which generally worked three or four hours at a stretch.

Where there were once dozens of these tide mills, there are now only a few forlorn survivors. The first mill was built in 1604 by French explorers on the St. Croix river, Maine. Others, of later origin, are to be found still operating at Kennebunkport, and East Boothbay, Maine. At the latter, the frame work for Commander Donald B. MacMillan's schooner "Bowdoin" was sawed out.

CRAZY MUSIC from

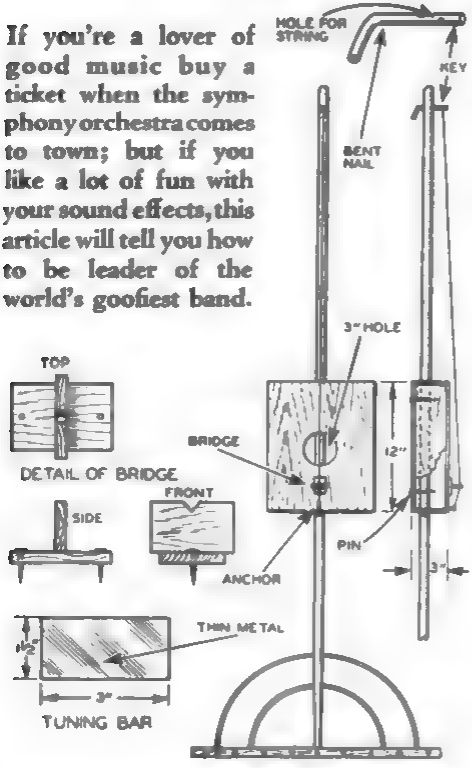


All the details and dimensions you will need in making the pop bottle organ, the musical chair, the lip whistle and auto horn trombone are given on this plate. In making all of the instruments shown here an ear for music and a lot of care in tuning are much more important than exact dimensions. Additional instruments may be added to your orchestra by using quart beer bottles for a second bottle organ and by using different size musical chairs. The trombone can be lubricated with saliva.

ODDS and ENDS

by THORNTON HALLETT

If you're a lover of good music buy a ticket when the symphony orchestra comes to town; but if you like a lot of fun with your sound effects, this article will tell you how to be leader of the world's goofiest band.



All necessary dimensions for constructing the hay-rake cello are shown on the working drawing at the left. After making hey! hey! all winter the rake may be used again for making hay.

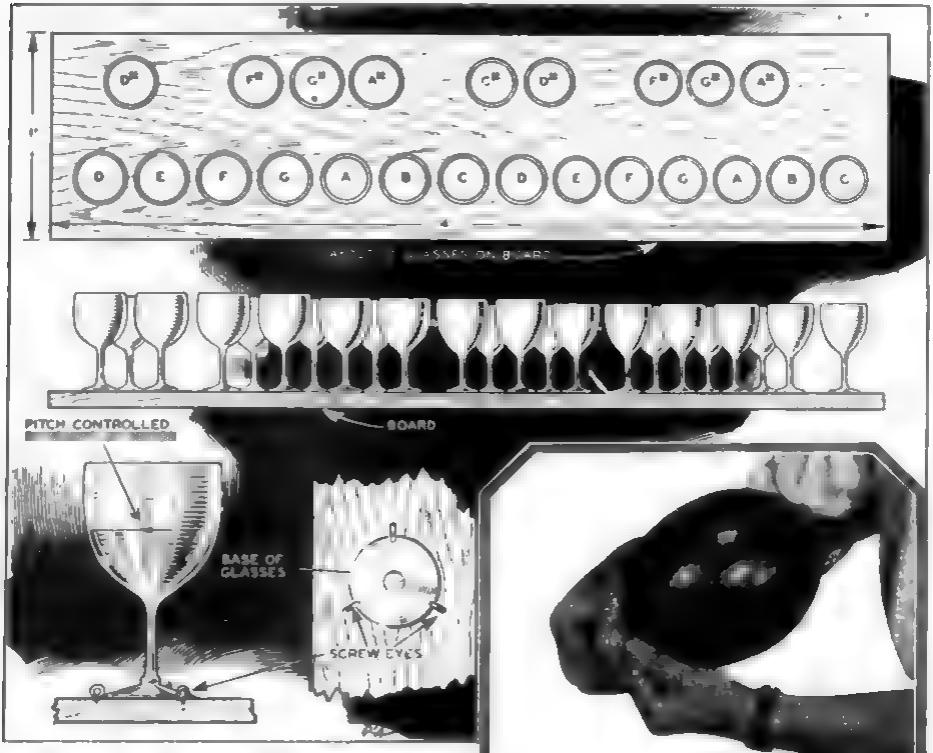
TWEET, TWEET—Zoom, zoom—Blah, blah! Boy, oh, Boy—just hear them melody and listen to those sound. Ain't them sweet? That's the "Crazy Music Band" —and How. They're playing everything but the kitchen sink and they'll have that next. There's Granpa's rake, Granma's weddin' goblets, Brother Bill's tire pump and Uncle Zeke's radio loud speaker. Well, well, well! Let's see how they do it. Perhaps we can organize a band of our own and serenade Santa Claus this Christmas eve.

Got a nice old fashioned wooden hay rake with a couple of teeth missing? Fine! Here's where we can manufacture a cello that'll knock your neighbor's ear off.

First swipe a thin wooden box from your grocer, that measures about a foot long by 8 inches wide and 3 or 4 inches deep. Cut a hole in the best flat side right in the middle and about 3 inches in diameter. Then in each end cut a hole that will just fit over the rake handle.

Slide the box down over the handle until it's just below the center. Fasten it securely with two or three little screws so it will not turn or slide. Fasten a screw-eye to the bottom edge of the box and just above it fasten a bridge as shown in the detail sketch. Drill a hole in the top of the rake handle and force in a large wire spike bent at right angles as a key. Drill a small hole through the projecting shaft.

Now get a piece of fine steel wire, a long guitar string or snitch a string out of the piano. Fasten one end to the screw-eye, bring the wire up over the notch in the bridge and fasten the other end through the key. Then wind the key up until the wire is taut enough to say "do" when you pluck it. Now all you need is a tuning bar



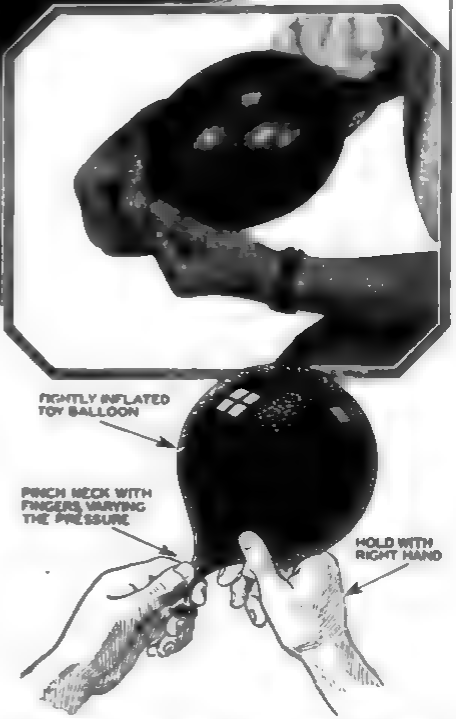
In the Glassorymba, illustrated in drawings above, three sizes of long-stemmed glasses are required.

consisting of a piece of tin 3 by 2½ inches and a violin bow.

Will she play? Just bear down on the string with the tuning bar and draw the bow across above the hole in the box. Slide the bar along the wire to vary the pitch and in a couple of hours you can play anything from Home Sweet Home to The Parade of the Wooden Soldiers, just like nobody's business. If you haven't a bow just pluck the string. It'll sound just as bad.

Have you a baby in the family? If so; just borrow his toy balloon and play some sweet music. Blow it up to the saturation point and then pinch the neck tightly with the fingers of the left hand. Then gently close the opening with the thumb and forefinger of the right hand to flatten the lips. Release some of the air with the left and by varying the pressure with the right fingers you can make it squawk up and down the scale in wonderful style.

With a little practice you can play all the

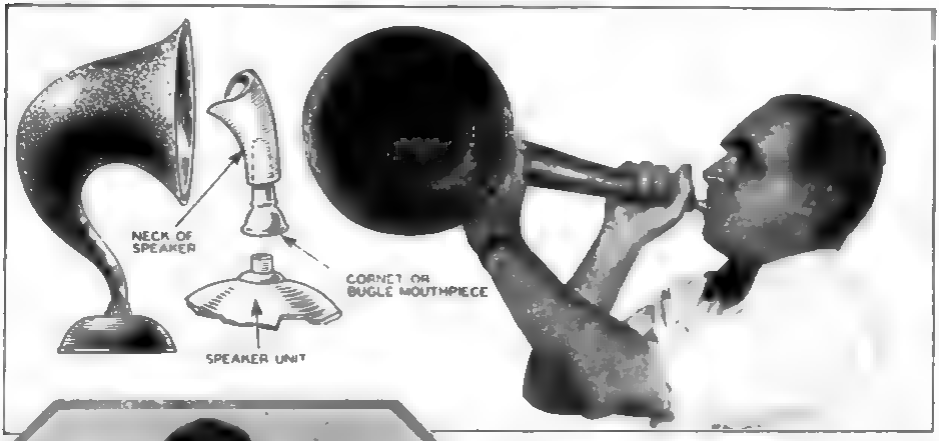


The drawing and photo above will show you all you will need to know to play more or less sweet music with the baby's big red toy balloon.

simple tunes in fine style. It's been done—many times—and always gets a laugh. Even good duets can be played by two persons skilled in the art of toy balloon technique.

Nothing is quite so crazy as a "Kitchen chair Harp". After the family has bitten

Blowing Bugle Calls on the Loud Speaker Bugle Will Wake the Dead



An old-fashioned loud-speaker horn, a cornet mouthpiece, and you can play real bugle calls.

No preliminary work is required to play the automobile tire pump. Just practice a few hours as shown above and you can master any tune.

out several rungs from the back of a wooden chair just saw out the rest and you will have a chair with nothing but the seat, legs and the back frame. Drill a dozen or more holes through the top of this back as disclosed in the sketch and insert violin or banjo keys with the knobs at the rear. Place as many small screw-eyes at the rear edge of the seat and then proceed to string up exactly as you would a harp. Tune the strings with the piano and there you have it.

Now comes the masterpiece of them all—the Glassorymba. As it would be grand larceny to steal twenty-three glass goblets you will have to buy that many from the five-and-ten. Then get a wide board about 4 ft. long and a flock of screw-eyes. Starting at the left end of the board, arrange fourteen goblets in a line about one inch apart with the largest ones at the left. They are secured to the board by three screw-eyes placed equidistantly about the goblet base turned down just tight enough to hold the base without pinching it. In front, on the board, mark their places in the scale starting with D below middle C.

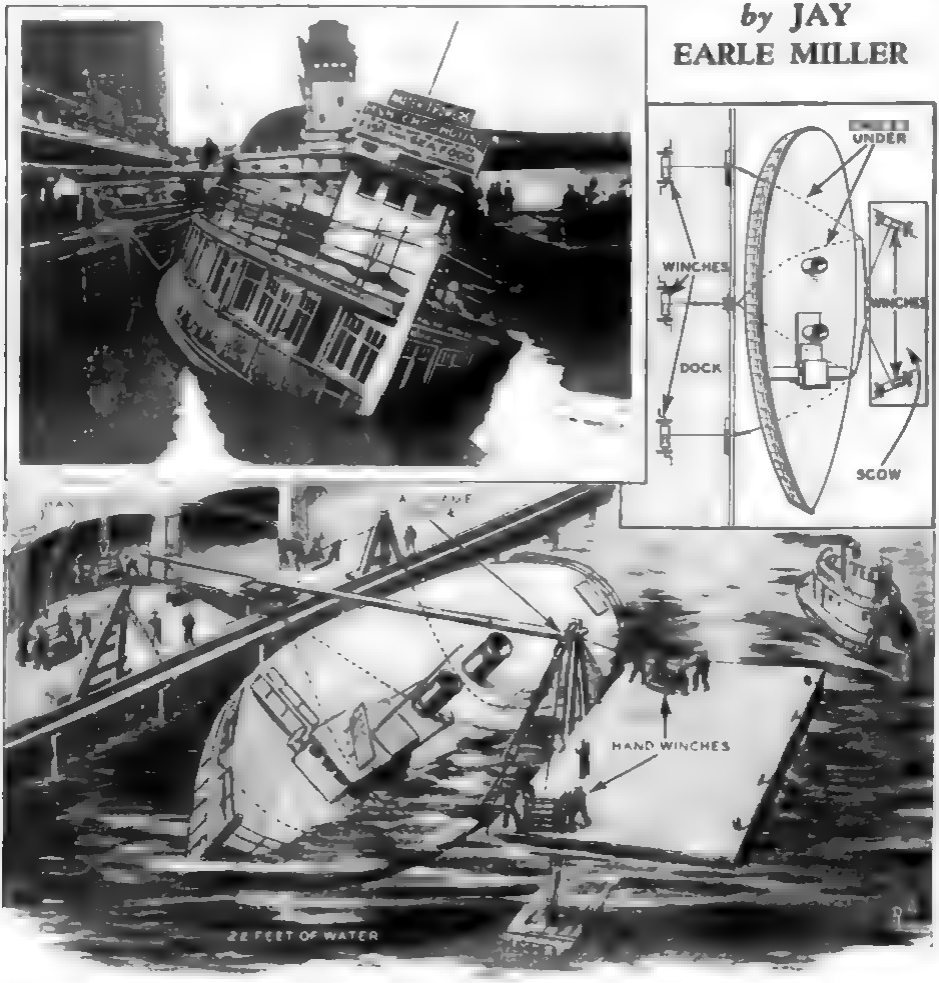
Then near the back edge of the board arrange the remaining goblets to take care of the half tones of the scale and label them also. With Sister Julia at the piano; fill each glass partially with water and tap the glass with the finger. More water raises the pitch and less water lowers it. By shifting goblets and altering the water supply you can easily create the entire scale very truthfully.

Playing is done by rubbing the fingers smartly over the edge of the glass after applying a little fuller's earth to the finger tips. Not crazy music at all but the sweetest

(Continued on page 190)

Unique Salvage Method

by JAY EARLE MILLER



Top photo shows the Chicago ship lying heeled over, with hull buried in mud under 22 feet of water. Drawing at right shows positions of cables and winches. Below—General view of salvage operations.

AN UNUSUAL method of raising a sunken ship was undertaken by Chicago engineers recently when they attempted to raise by hand a 200 ton vessel, 176 feet long by 42 feet beam, whose hull was buried in mud under 22 feet of water. The scheme called for the services of only eight men who turned two sets of hand winches to raise the ship, and suspend it in a cradle of four steel cables while the hull was being pumped out.

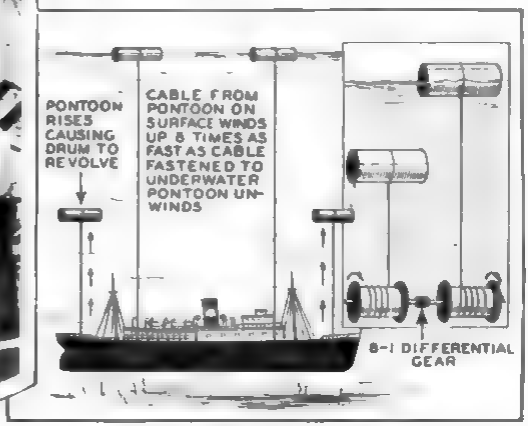
One special purpose of the plan was to protect the hull against breakage. Four cables were used to distribute the weight evenly over the hull. The ends of the cables were secured to blocks and falls attached to "A" frames on the dock and the barge, as shown in above drawings.

The falls secured to the wire cable were led to the hand winches. After slack had been taken up by dock winches, all the lifting was done by those on the scow, with four men at each winch.

Raises Ship by Hand

View after the ship had been partly lifted off the river bed, righted, and was hanging in cables waiting for hull to be pumped out. Note "I" beam.

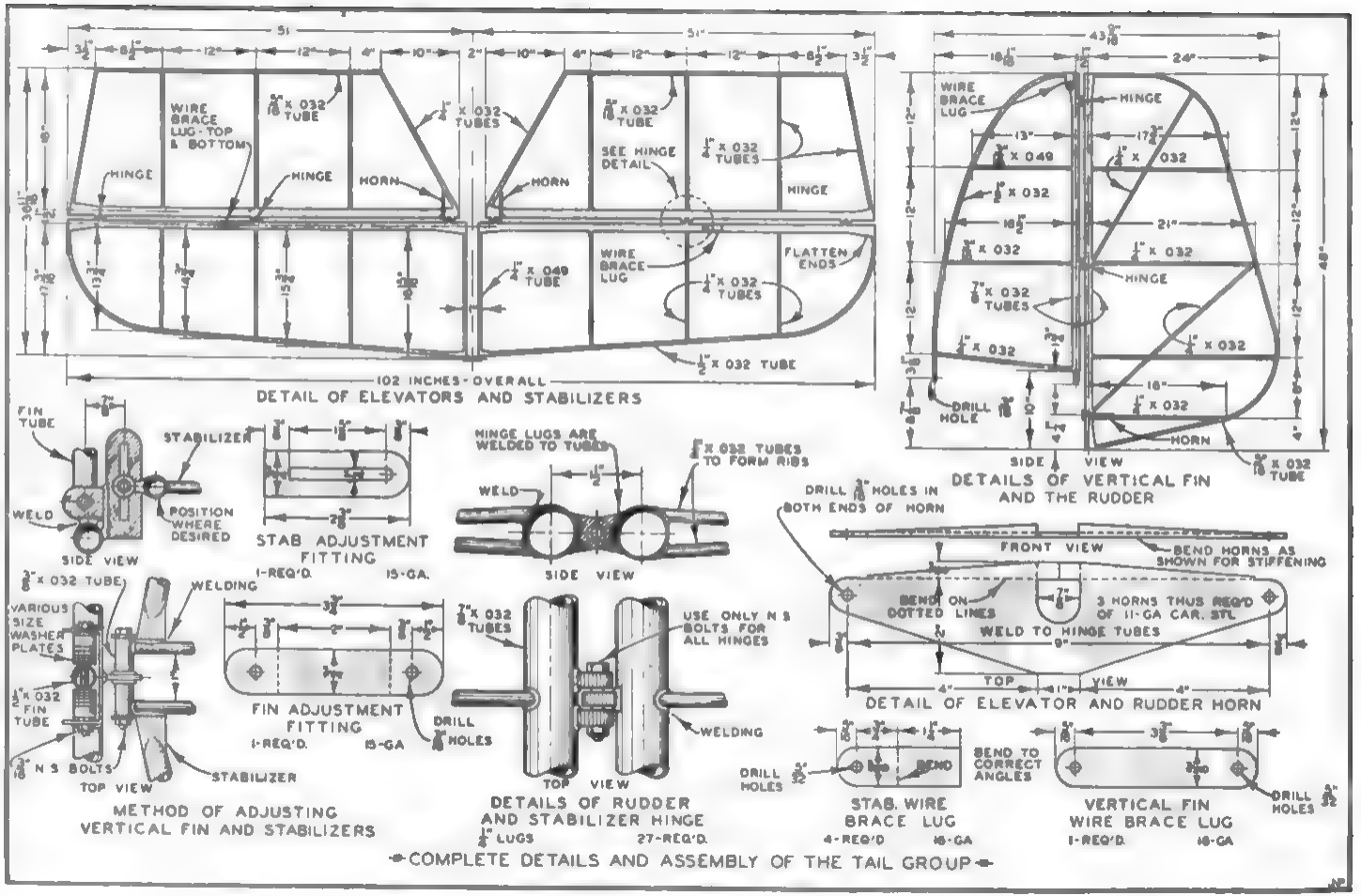
This photo shows diver descending in river to hook up tackle from steel "A" frame which was mounted on river bed alongside wreck.



Drawing shows operation of revolving differential gear, which, attached to ship's hull, is lifted to surface by means of pontoon from which the air has been blown.

When the upper deck was raised well above the river level by this scheme, divers set to work patching the hull so that water could be pumped out to keep the vessel afloat.

This unique scheme was worked out by Sebastian Schwager, a salvage engineer, who is the inventor of a recently patented device for lifting ships from the sea bottom. The device is a double acting shaft, with twin winch drums and an eight-to-one ratio differential gear. The sunken pontoon, trying to rise, will, when the air has been blown out, unwind the cable from the drum and turn the shaft, thus causing double-acting shaft to lift the ship.


DETAIL OF ELEVATORS AND STABILIZERS
WIRE BRACE LUG - TOP & BOTTOM
HINGE
HORN
SEE HINGE DETAIL
FLATTEN ENDS
WIRE BRACE LUG
102 INCHES - OVERALL
DETAILS OF VERTICAL FIN AND THE RUDDER
DRILL HOLE
SIDE VIEW
FRONT VIEW
HORN
DETAIL OF ELEVATOR AND RUDDER HORN
DRILL HOLES IN BOTH ENDS OF HORN
BEND ON DOTTED LINES
WELD TO HINGE TUBES
TOP VIEW
BEND HORNS AS SHOWN FOR STIFFENING
3 HORNS THUS REQ'D OF 11-GA CAR. STL
FIN TUBE
STABILIZER
WELD
POSITION WHERE DESIRED
STAB ADJUSTMENT FITTING
1-REQ'D.
15-GA.
HINGE LUGS ARE WELDED TO TUBES
TO FORM RIBS
VARIOUS SIZE WASHER PLATES
WELDING
N S BOLTS
METHOD OF ADJUSTING VERTICAL FIN AND STABILIZERS
FIN ADJUSTMENT FITTING
DRILL HOLES
USE ONLY N S BOLTS FOR ALL HINGES
DETAILS OF RUDDER AND STABILIZER HINGE
LUGS
27-REQ'D.
STAB. WIRE BRACE LUG
4-REQ'D
16-GA
BEND TO CORRECT ANGLES
VERTICAL FIN WIRE BRACE LUG
1-REQ'D.
16-GA
COMPLETE DETAILS AND ASSEMBLY OF THE TAIL GROUP

BUILDING *the* RAMSEY

Flying Bathtub

by **W. H. RAMSEY**

This is the last installment of the Aeronca powered Flying Bathtub, a two-place, side-by-side monoplane that is ideal for cross-country work, with its cruising range of 150 miles on five gallons.

PART III

LAST month we took up the matter of constructing the wing, having taken care of the fuselage and outrigger in the first installment. We are now ready for the welded steel empennage, the struts, minor fittings, and the final job of rigging and covering, all of which will be completed in this issue.

The various photographs we have shown of the original ship, and especially the one shown here, will give you a good idea of the external appearance of the tail surfaces.

The working drawing of the tail group will show you everything you will need to know about this part of the job. The entire empennage is welded up of steel tubing, and if you don't forget the extra care which the smaller sized tubing will require in welding you should have no trouble with this work.

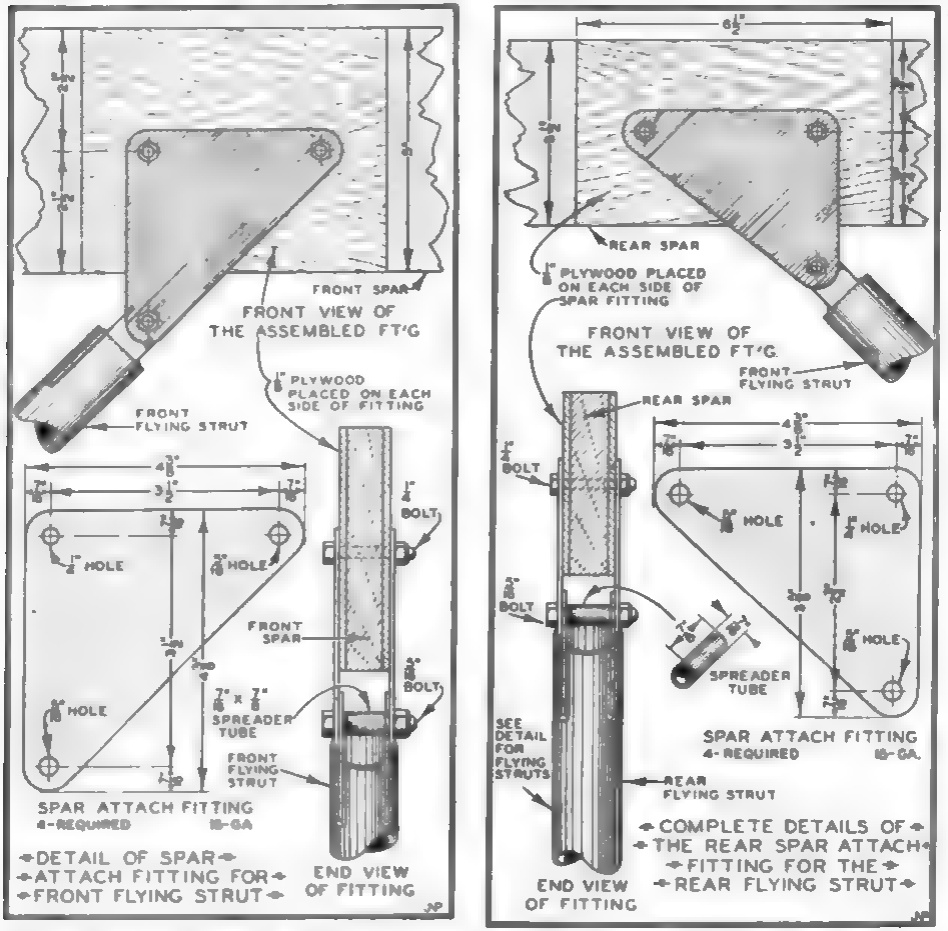
There is little difference between the horizontal stabilizer assembly and the vertical-fin rudder assembly save size and position. The stabilizer and rudder both have ⅞" x .032 tube hinge beams, while 5/16" x .032 and ¼" x .032 steel tubing is used elsewhere, as pointed out in the drawing.

You will find that the empennage will warp considerably where the light tubing is used, but with a little careful checking and lining up by hand, bending cold, for there is little bending to be done, you will get a perfect job.

There is quite a trick to heating a steel tube in the proper place to get the right results. Heat the tube on the side which is to be bent to a dull red. At first this actually increases the bend, but when the tubing cools

A good idea of the general appearance of the tail assembly and outrigger is given in this photo.

Complete Details for Attaching the Flying Struts to the Wing Spars



These two working drawings give dimensions and details for attaching the front and rear flying struts to the wing spars. You will note that the spruce spars are protected by placing a piece of 1/16" plywood between them and the strut fittings, which are made of 20 gauge steel. Reference to the plate on page 136 of last month's installment will reveal that the flying struts are attached to the spars between the last two full ribs on each wing. Be sure to place these important fittings accurately.

off you will find that it has assumed an angle opposite to the original bend, and almost invariably comes out exactly right.

In handling small tubing, extreme care must be taken not to get the metal too hot and burn the tubing. It is easy to tell if the weld is good. If it is so clean that it looks as if new metal had been placed there the job is okay. A poor weld has a sand effect on the outside and is very scaly. If these faults show up, throw that piece away and build a new piece.

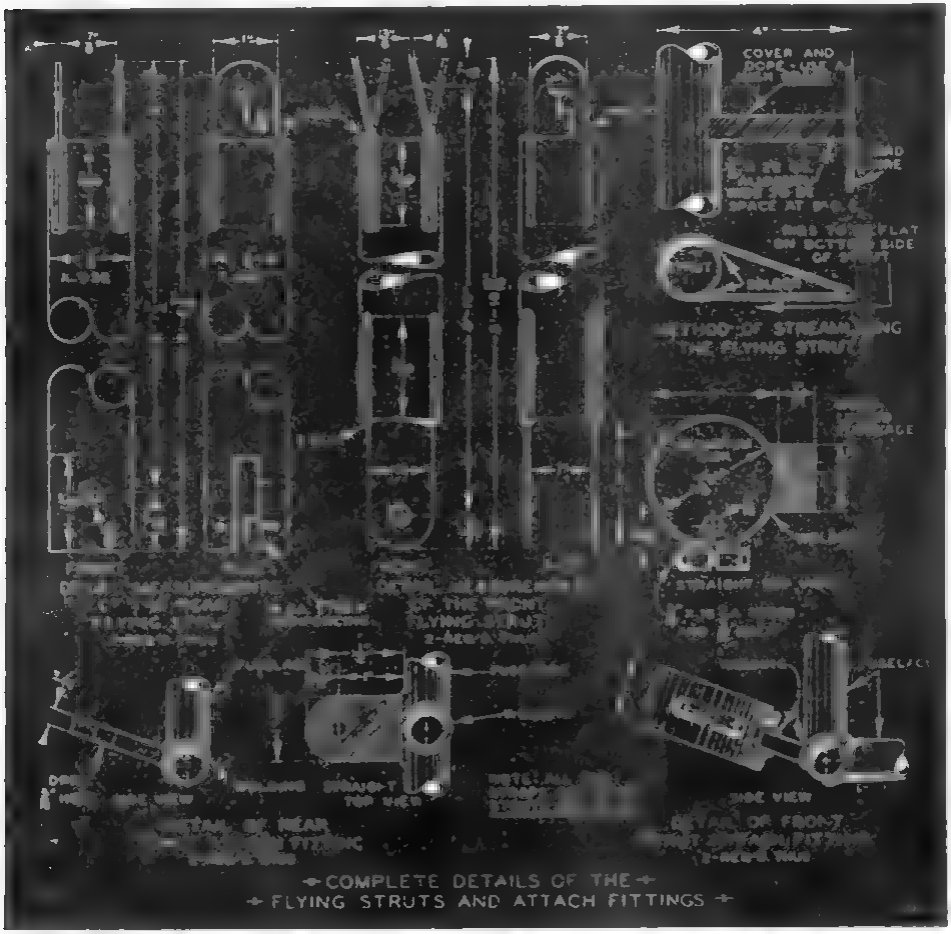
It is for this reason that I advise that you call in a welder for a couple of days if you can't do a good job yourself. The man's wages could easily be less than the cost of the material you might spoil.

CONTROLS

The working drawing on the last page of this article gives such a complete description of the control assembly that further comment is unnecessary.

You will note that the pedal assembly is for dual controls, while there is only one stick, which is rigged up in the center of the cockpit. The pilot, therefore, will have the stick at one side instead of between his legs.

This Plate Gives All the Necessary Details for Making the Wing Spars



Complete details of the flying struts and attachment fittings are given on this plate. All struts are of 1¼"x .032 gauge chrome molybdenum steel tubing, streamlined with ribs of ⅜"x22 gauge aluminum soldered to the struts and spaced nine inches from center to center. These are covered with aircraft fabric and doped. If these struts and fittings are constructed accurately you won't have to worry about the angle of attack of the wings, as this has been taken care of on the drawings.

The gun should be placed on the most convenient side for the one who will usually do the taking off and landing. If dual control is not desired, one set of pedals may be omitted.

RIGGING

Both wing panels should be set exactly alike. The horizontal stabilizer should be level unless it is found necessary to correct for either nose or tail heaviness. Take plenty of time, get everything correct, and a good flying ship will be your reward.

WING STRUTS

The wing struts are made up of 1¼ inch by .032 gauge chrome molybdenum steel tubing, and are streamlined with ribs of ⅜ inch by 22 gauge aluminum, spaced nine inches from center to center, and soldered to the struts. A hard wire carried inside the bend of the ribs forms the trailing edge of this streamlining.

The struts are covered with airplane fabric and doped. It is well to attach the lower end of the strut, and then apply your fabric envelope before attaching the upper end to the wing.

Incidentally, it is possible to purchase streamlined tubing from any of the larger air-

craft supply houses. If streamlined tubing is used it will save you the trouble of soldering on the aluminum ribs and covering; but on the other hand, the strut attachment fittings will have to be adapted to the tubing used, as all of the drawings anticipate that round tubing would be used throughout the plane.

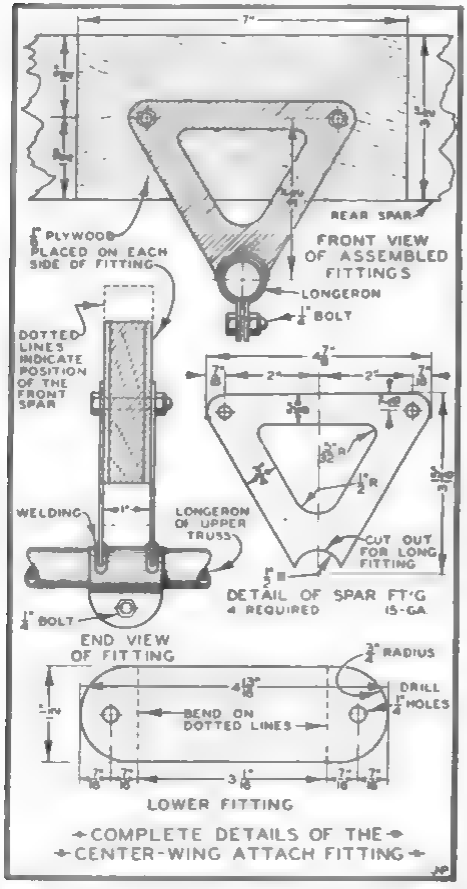
INSTRUMENT BOARD

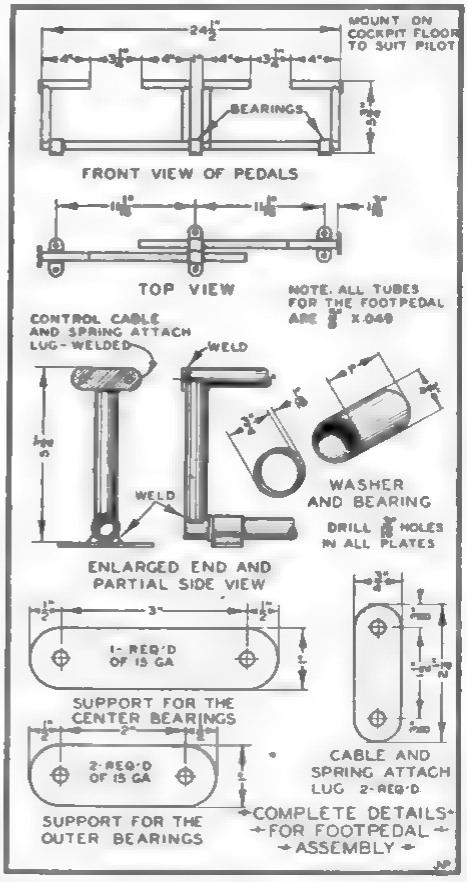
This is made from a piece of plywood ¼ inch thick and cut to fit under the cowling. The form should first be secured by cutting a paper pattern, and then using that to cut the correct form on the plywood. Next, the exact size of the holes for the instruments can be cut by an expansion wood bit.

What instruments you will use will depend largely upon your purse and the use you expect to make of your plane. Ordinarily a tachometer, altimeter, oil pressure gauge, and distance type thermometer will be sufficient, with a compass added if you plan to do cross-country work over strange terrain.

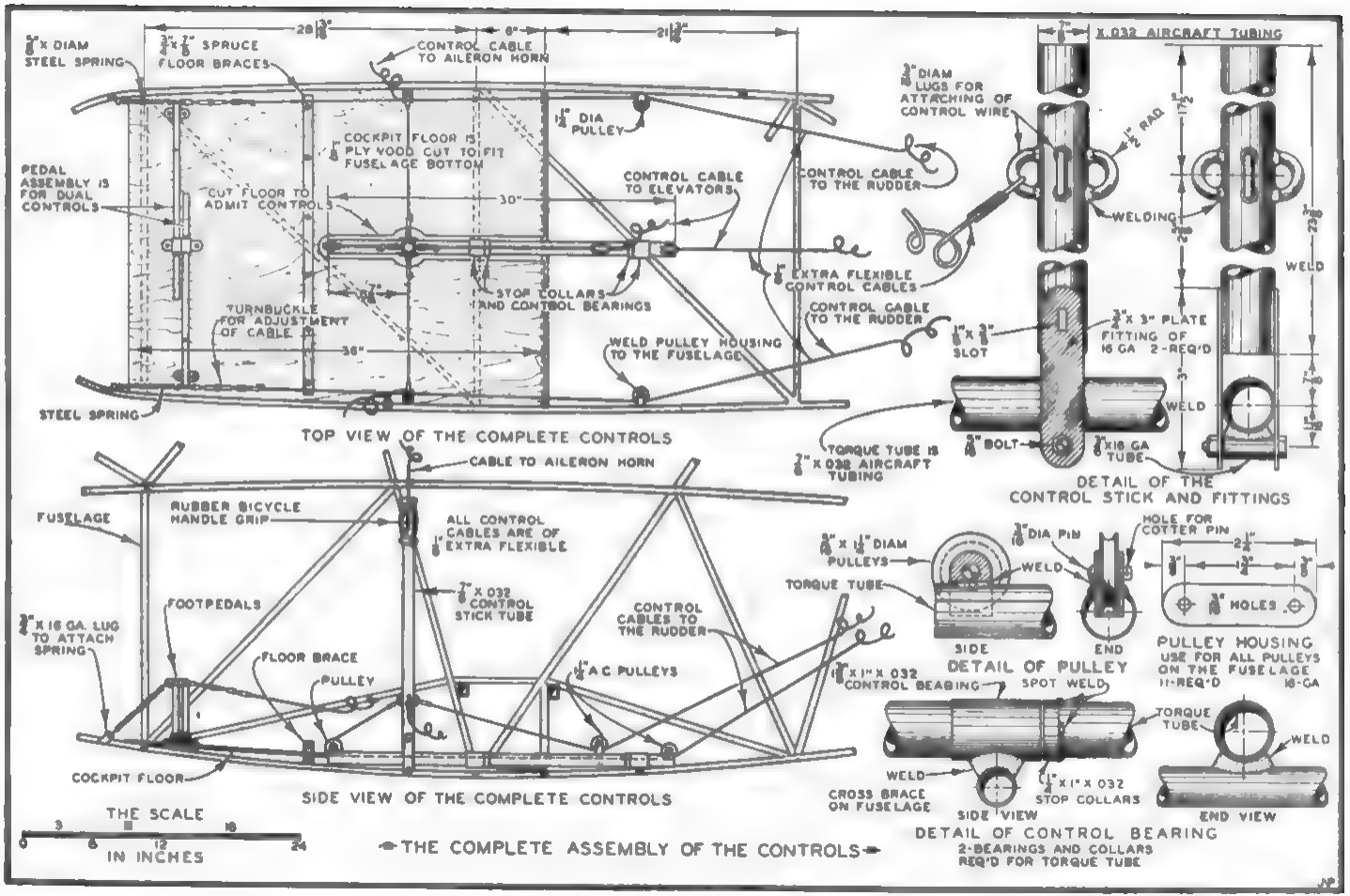
COVER AND DOPING

This procedure should be carried out by the envelope method wherever possible, and the open edges hand sewed. Use three coats of clear dope and two of pigmented dope, applying the first coat with either a brush or a low pressure spray gun. Be sure the first coat thoroughly penetrates and fills the fabric and that all other coats thoroughly cover. Doping should be done under fairly warm conditions and each coat permitted to dry before further application.





These working drawings show the method of attaching the wing to the top longerons, and give you full details for the dual control foot assembly. One set of pedals may be omitted if you so desire.


X DIAM STEEL SPRING
SPRUCE FLOOR BRACES
CONTROL CABLE TO AILERON HORN
DIA PULLEY
COCKPIT FLOOR IS PLY WOOD CUT TO FIT FUSELAGE BOTTOM
PEDAL ASSEMBLY IS FOR DUAL CONTROLS
CUT FLOOR TO ADMIT CONTROLS
CONTROL CABLE TO ELEVATORS
CONTROL CABLE TO THE RUDDER
EXTRA FLEXIBLE CONTROL CABLES
STOP COLLARS AND CONTROL BEARINGS
TURNBUCKLE FOR ADJUSTMENT OF CABLE
WELD PULLEY HOUSING TO THE FUSELAGE
STEEL SPRING
TOP VIEW OF THE COMPLETE CONTROLS
CABLE TO AILERON HORN
RUBBER BICYCLE HANDLE GRIP
FUSELAGE
ALL CONTROL CABLES ARE OF EXTRA FLEXIBLE
X 032 CONTROL STICK TUBE
FOOTPEDALS
X 16 GA. LUG TO ATTACH SPRING
FLOOR BRACE
PULLEY
CONTROL CABLES TO THE RUDDER
A C PULLEYS
COCKPIT FLOOR
SIDE VIEW OF THE COMPLETE CONTROLS
THE SCALE
IN INCHES
THE COMPLETE ASSEMBLY OF THE CONTROLS
X 032 AIRCRAFT TUBING
DIAM LUGS FOR ATTACHING OF CONTROL WIRE
RAD
WELDING
WELD
X 3" PLATE FITTING OF 16 GA 2-REQ'D
SLOT
TORQUE TUBE IS X 032 AIRCRAFT TUBING
BOLT
X 16 GA TUBE
DETAIL OF THE CONTROL STICK AND FITTINGS
X DIAM PULLEYS
TORQUE TUBE
DIA PIN
WELD
HOLE FOR COTTER PIN
HOLES
SIDE
END
DETAIL OF PULLEY
PULLEY HOUSING USE FOR ALL PULLEYS ON THE FUSELAGE 11-REQ'D 16-GA
X 1" X 032 CONTROL BEARING
SPOT WELD
TORQUE TUBE
WELD
CROSS BRACE ON FUSELAGE
X 1" X 032 STOP COLLARS
SIDE VIEW
END VIEW
DETAIL OF CONTROL BEARING
2-BEARINGS AND COLLARS REQ'D FOR TORQUE TUBE

"Experimental Toy" Airplane Has Control Stick in Roof

The odd one-wheeled plane built by Charles W. Hall for his own amusement is shown above. Note small stabilizing wheels.

THE curious one-wheeled plane shown at the left is the experimental toy of Charles W. Hall, president of the Hall Aluminum Aircraft Company of Buffalo, N. Y. Hall has built something different just for himself, and even should it prove successful he doubts if it would ever be produced commercially.

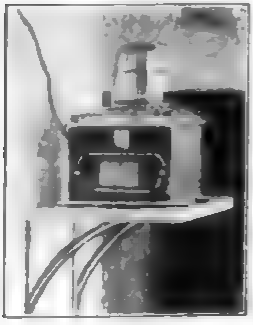
The ship is radical not only because of the fact that it has but one wheel, but also because the control stick is suspended from the roof of the cabin instead of occupying its usual place on the floor. Several other innovations are also included in the design.

Sound Photos Test Radio Sets

PICTURES of sound waves to test radio sets, so that the customer will know exactly what quality of reproduction he is buying instead of being compelled to take the word of the salesman or listen to the receiver in the noisy surroundings of the average radio store, are suggested by Mr. O. H. Caldwell of New York City, former United States Radio Commissioner and now editor of a professional magazine.

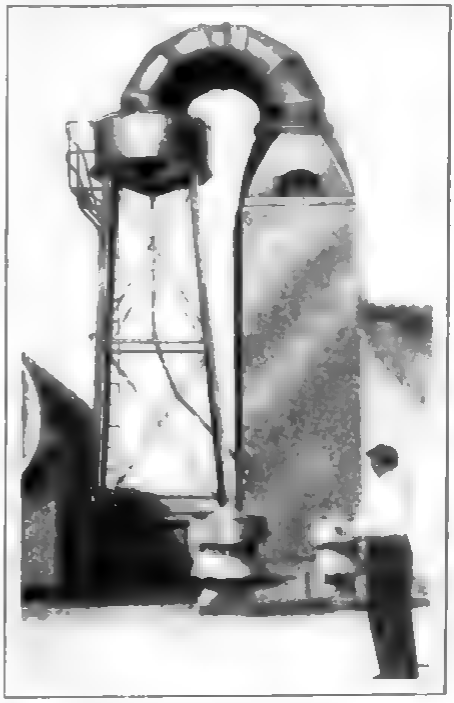
Modern oscillographs and other sound-measuring devices now make possible photography of the wave forms of sounds emitted by radio receivers as well as exact analysis of the perfection with which each receiver reproduces what comes to it from the broadcasting station. These devices now are used in laboratories for research purposes and to test new radio designs. The radio industry would benefit, Mr. Caldwell believes, if they were used for sales purposes also.

Electric Eye Regulates Light



Lights are automatically turned on, off with electric eye switch shown here.

ANOTHER job has been found for the electric eye. It now does duty as an automatic switch to turn on the lights in factories and offices when darkness comes and to switch the lights off when daylight arrives. This is done by a delicately adjusted detector.

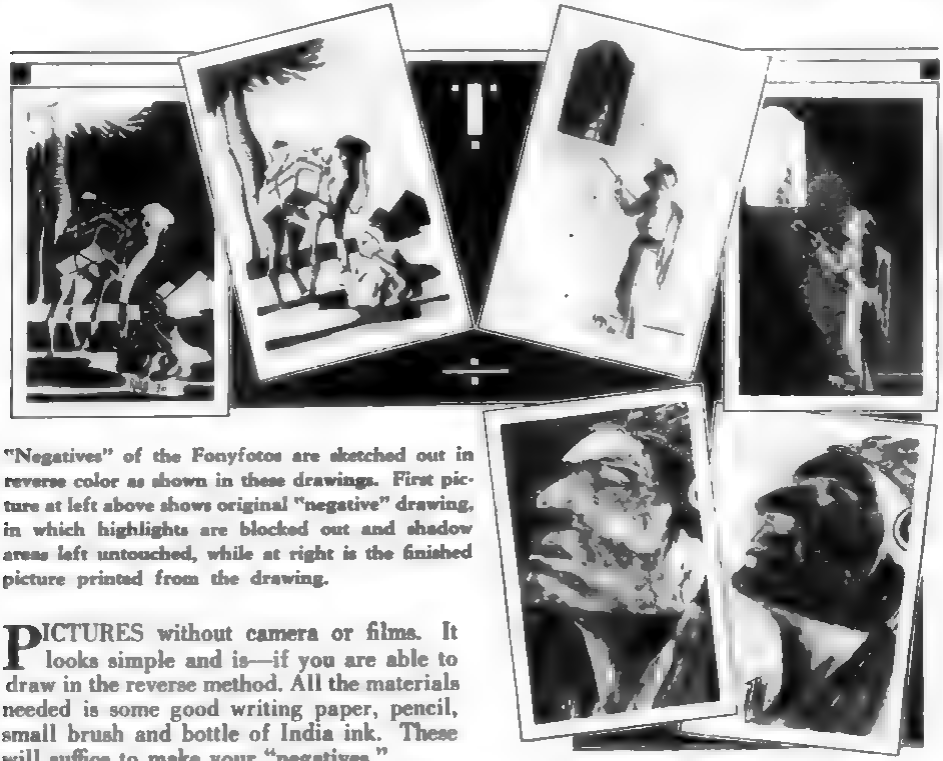


This unique stack directs the smoke and fumes through a basin of water which controls draft.

Smoke-Stack Abates Spark Hazard

A NEW type smoke-stack is said to abate the smoke and spark hazard and to save fuel by promoting more perfect combustion. The smoke passes through a basin of water before leaving the stack.

FONYFOTOS *Make Artistic Pictures*



"Negatives" of the Fonyfotos are sketched out in reverse color as shown in these drawings. First picture at left above shows original "negative" drawing, in which highlights are blocked out and shadow areas left untouched, while at right is the finished picture printed from the drawing.

PICTURES without camera or films. It looks simple and is—if you are able to draw in the reverse method. All the materials needed is some good writing paper, pencil, small brush and bottle of India ink. These will suffice to make your "negatives."

To make these you sketch your picture lightly on the paper with pencil. Always keep in mind that you are working in the reversed method of drawing—that is, when you draw a black line on white paper, the line will print out white on your printing paper, and the white part will print out black.

After your pencil sketch is made, you are ready to "fill in" and shade. This is the difficult part. For example: Your sketch is a human head. You wish the background to be white in the finished picture. Therefore, fill in the background in your sketch with India ink. For the features, where you wish "high-lights" to appear, darken these places on your sketch with India ink thinned with water. Shading around nose, mouth, eyes, etc., is accomplished in like manner, always remembering that what is dark on your sketch will be light in the printed picture. A little practice will be required to accomplish the shading technique. Density of the shading depends upon the opaqueness of your ink-water solution. Use it thin at first, going over it to produce darker tone effects.

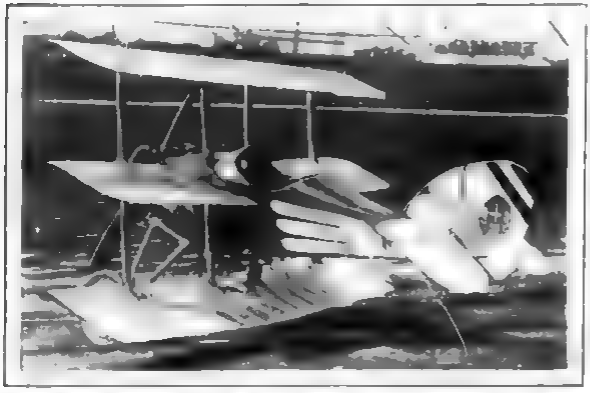
In printing your picture, use the ordinary printing paper used for regulation film. If you wish the picture to be the same as sketch, place the latter in printing frame SKETCH side towards glass. If you prefer your image turned just the opposite, place sketch side towards printing paper.

Expose to 60-watt light about 45 seconds. Proceed in the regular manner to develop and "fix" your print.—Robert M. Hyatt.

High Speed Film Improves Movies

TO TAKE better pictures of a peculiar mist on Mars, scientists have invented a triple speed film, which will also go a long way towards improving the movies. The new film is three times as fast as the old film, and permits reduction of amount of light necessary for making clear pictures. In addition, the focus is much deeper, so that highly artistic photography is possible.

World's Smallest Practical Airplane Is Launched in Italy



This tiny triplane can be parked in an ordinary garage.

THE Ricci triplane, said to be the smallest airworthy airplane ever constructed, has recently been launched at Rome, Italy. The tiny ship is equipped with a 45 horsepower radial air-cooled motor, and in test flights showed a top speed of one hundred miles an hour and a cruising speed of 75 miles an hour, going fifty miles on a gallon of gasoline. With its five-gallon gas tank, this would give it a cruising range of 250 miles.

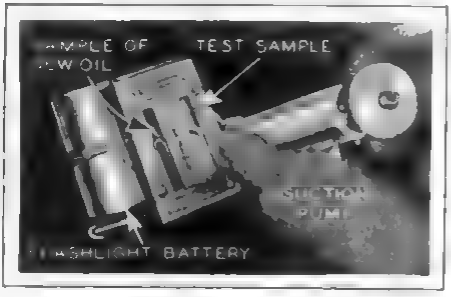
The plane has three sets of wings connected by four streamlined struts. The upper and lower wings are equipped with ailerons, while the center one is not. The wings are staggered, the lower one being just behind the top of the landing wheels.

Radio Beacon Controlled by Dial

PILOTS crossing the Potomac River are now guided to the various airports about Washington, D. C., by radio beacons which are set in operation by dials, resembling automatic telephones, situated at one of the three remote control points. The dialing starts and stops a "path" of dots and dashes.

Shows Condition of Car's Oil

TO SEE at an instant the degree to which the oil in your car has decomposed or carbonated there is now on the market a portable tester with a suction-pump handle, one stroke of which draws a sample of oil from the crankcase into an illuminated glass tube where its color is compared with a sample of new oil and with a piece of glass colored to represent oil just beginning to show signs of decomposition. Flashlight batteries furnish current for lighting up the glass tubing. An oil in which carbon and dirt are not present in excess will show some shade of brown.



By comparing the oil from your motor with a sample of new oil, decomposition is revealed.

Haying Speeded by Crusher-Mower

Alfalfa cut by this machine bales a greater weight per cubic foot and brings a higher price.

A POWER mower with a crusher on the order of a clothes wringer crushes the stems of hay or alfalfa, permitting them to dry in half the usual time, thus greatly improving the color as well as the feed value of the products.

The cut hay passes between rubber-covered steel rollers mounted parallel to the cutter bar. The upper roller floats under a 2,000 pound tension maintained by two springs, but the lower roller is held rigidly. The whole unit is mounted on a tractor, and the mechanism is driven through a chain from a sprocket on the pulley jackshaft of the tractor.

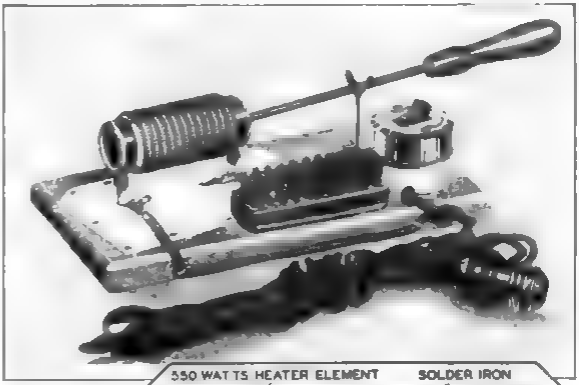
Amateur Electrician

Edited by SEWELL LEHMAN

An Electric Soldering Iron Heater

AN OLD resistance unit salvaged from an electric heater will make an excellent heater for a small soldering iron. Placed on the inside of the heating cylinder, the iron keeps hot and ready for use at any moment.

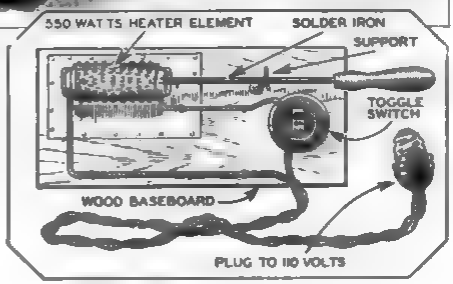
The baseboard on which the parts are mounted should be about 4½ in. by 9 in. and sandpapered for appearance's sake. As protection against the heat, a pad of several layers of asbestos is placed in the position shown in the drawing and the heater element mounted over it on a pair of angle irons. To support the iron a "Y" upright made from stiff wire is mounted at the side in the position shown. A toggle switch to control the current should be mounted on the front of the board.



Completed heater, ready for solder job, is shown above.

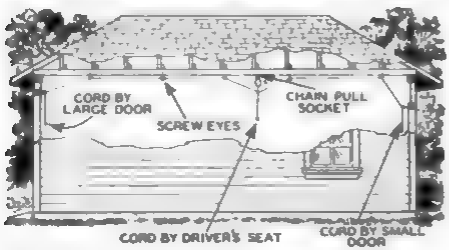
The switch and heater element are wired up according to the diagram given at the right. To prevent charring of the insulation run the wire out to the side as illustrated, as the resistance gives off quite a bit of heat. An extension cord of the length best suited for your needs serves to connect the heater to the 110 volts house current.

When doing a soldering job a wire brush will be found helpful to keep the iron clean and bright. A small iron is to be used here, and does excellent duty when handling small work as in a radio set.



Parts should be mounted on base board as shown. Note arrangement of wires and asbestos pad.

Handy Pull Cords Hooked to Light Socket Eliminate Expensive Switches

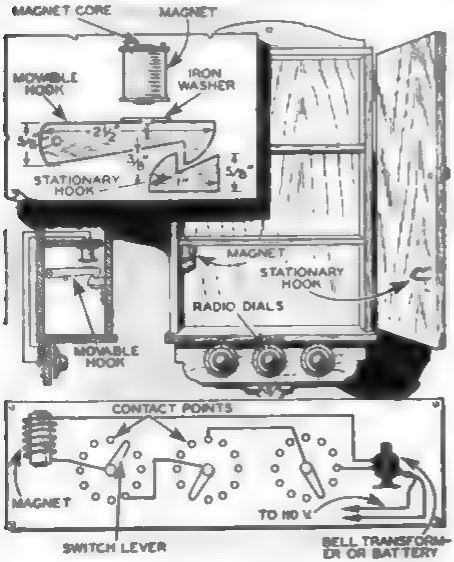


Pull cords by doors and from center of garage are run through eyes to light socket as shown here.

TAKE an ordinary chain-pull socket, the necessary length of strong cord, preferably braided, seven or eight screw eyes for guides, arrange them as shown in the accompanying drawing, and you have an efficient, convenient installation which takes the place of expensive electric wires and switches.

The center cord is in easy reach from the driver's seat. The light may be turned off as you leave the garage either through the large or the small door. At night the light can be turned on at either door.

Magnetic Lock Opens Only on the Right Dial Combination



Latch levers are fastened to the box in positions given above. Right combination operates magnets.

EVERY one at some time or other has had the need for a strong box in which to keep valuable personal possessions. A box for this use having a secret opening combination may be made for very little cost and with a small amount of work. The parts needed are a magnet from an old horn, radio dial, some switch points, and a length of bell wire.

The first thing to do is to fasten the magnet to the bottom of one of the shelves as illustrated in the accompanying drawing. Then, from oak, shape the hooks which hold the door closed. The movable hook should have a large iron washer screwed to the end as shown in the drawing. Finally, fasten the stationary hook to the door in such a position that it will catch in the movable hook like a latch.

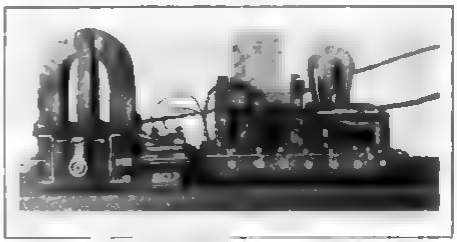
The latch is raised by means of three dials controlling as many switch arms. Contact points, over which the arms pass to unlock the door, are mounted on base panel as illustrated. The door can only be unlocked when all three arms touch the correct switch points.

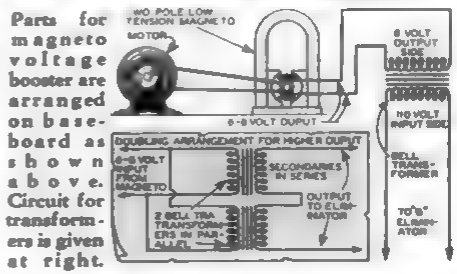
Bell Transformers Boost Magneto Voltage to Operate A. C. Receivers

HERE is a stunt that is well worth trying by any one not supplied with sufficient voltage for AC receiver operation. It makes use of the AC current furnished by the older types of magnetos used in automobiles to operate a B eliminator or power pack of a receiver.

Mount the magneto on a suitable bench or base that will also accommodate the driving motor. Belt it to the motor or engine by a suitable pulley so the driving speed will enable the magneto to turn over at about 3,600 r.p.m. If a four pole machine is secured, however, then its speed can be reduced to about 1,800 r. p. m. Proper pulley ratio together with a line rheostat will enable you to regulate the driving motor speed.

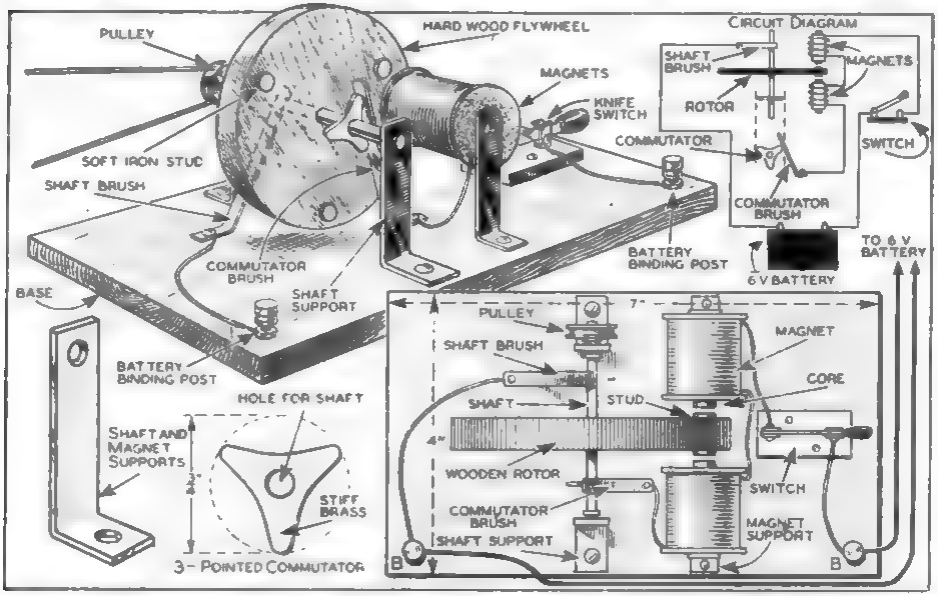
The voltage is built up by the use of a heavy-duty bell ringing transformer. One of from 150 to 200 watts is about right. Wire the output or 8-volt side direct to the output of the magneto. Then use the input side or 110-volt side of the transformer for the output. This should result in building up the magneto output to approximately 100 volts AC. When passed through the B eliminator the result will be about 90 volts pure DC If higher voltages are desired a doubling system comes in handy as shown. This consists of connecting the 8-volt sides of two bell transformers in parallel and connecting the two 110-volt sides in series, as illustrated in the accompanying drawing. Fully 180 volts can be thus procured and for output regulation a variable resistance can be inserted in one side of this output circuit





Parts for magneto voltage booster are arranged on baseboard as shown above. Circuit for transformers is given at right.

Midget Motor With Wooden Rotor Operates Small Toys



Drawings here illustrate assembly and wiring of the motor parts. Current to magnets is interrupted by means of three-pointed commutator and brush. Motor is turned by means of magnets pulling on studs.

FOR combined simplicity and power you can't beat this little three-pole motor. Connect it to a six volt storage battery and it will easily operate any small toy. Complete plans are given in the drawings above.

The entire motor is mounted on a baseboard 4 in. by 7 in. The size of the parts are left up to the builder, but general proportions are given in the drawings. The first article on the list to be made is the rotor and magnet mountings, which are cut from heavy brass. Mountings to support the stiff wire shaft are set about the middle of the board. On this shaft is placed the stiff brass commutator and the wooden fly wheel, while at the end is bolted a small pulley.

Brushes, made of stiff brass and bolted to the base board, make contact with the commutator and shaft to interrupt the current to the magnets. Tension of the commutator brush should be loose enough so that only the points of the brush touch.

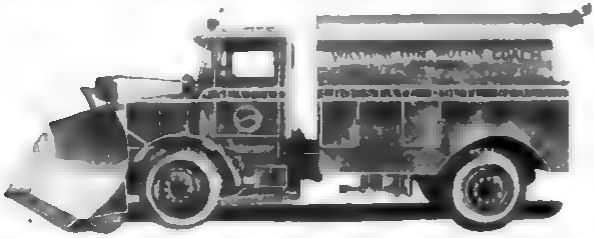
The flywheel is rotated by means of two magnets mounted on supports in the position shown in the drawings. About 200 turns of No. 22, DCC wire on a half inch diameter bolt will do duty as a magnet. Careful alignment of the cores is necessary so that the studs on the fly wheel come between them.

Wiring diagram for this motor is given in the drawings above. Some experimentation may be necessary to determine the correct position of the brushes. They should be so arranged that a connection is made just before the stud reaches the space between the magnet cores. A switch mounted on the baseboard serves to control the current to the magnets. Finally, connect the two binding posts to the six volt storage battery and you will see some tall speed from the motor.

Earn Money From Novel Amateur Electrician Stunts

Amateur Electrician Department is devoted to presenting Modern Mechanics readers with novel and inexpensive electrical stunts. If you want to earn money from that electrical gadget you've concocted in your workshop, draw up careful plans of it, write an adequate description, and send the results to Modern Mechanics Electrical Editor. Stunts that are novel, practical, easy to build and fairly inexpensive are what are wanted. Regular prices will be paid for accepted contributions.

Service Truck Carries Snow Plow to Keep the Roads Clear



Equipped with a plow on the front as shown, this truck does duty both as snow plow and road service truck for stalled autos.

A COMBINATION snow plow and service truck has been placed in service recently by a Washington transportation company. Roads clogged with snow cannot tie up traffic, since the truck clears a broad path by means of a Wassau snow plow of the "V" type, as shown in the accompanying photo.

For other emergencies the truck is well equipped also. A large assortment of tools for repair work are carried in the body. For towing jobs the truck carries a power winch mounted under the frame, as well as 300 feet of ⅝ inch cable.

A cubic yard of sand may be scattered about on icy roads by means of a spreader mounted under the chassis.

Strong Men Have Diseased Glands

A TEN-YEAR-OLD boy so strong that he pulls handcuffs in two with his fingers and breaks chains made of quarter-inch iron has been studied by a gland and nerve specialist of Berlin. The exceptional strength and bodily development are ascribed to a disorder of the gland which produces circus giants.

Swimming Pool for the House Top

MODERN inventiveness now gives us the seashore on the house top. With the portable tank, such as the one shown below, which was recently introduced in London, there is not such an urgent need to take a long, expensive trip to the seaside since swimming and diving and paddling are all to be enjoyed so handily. The water is held by a canvas bag, supported by iron framework.

A swimming pool on the house top, with slide and diving board. Water is held in huge canvas container supported by a framework of iron pipe.

Health Bread Made From Seaweed

Bread made of kelp, or seaweed, recently introduced by a California baker as wheat substitute.

BREAD made of kelp, or seaweed, was placed on sale recently in Ojai, California, a little town near the Pacific coast. Though wheat was on sale at as low a price as 25 cents per bushel, William Baker, who introduced the new bread, claims that his innovation is rapidly becoming popular because of its peculiar flavor.

Colored Glass Repels Insects

BLUE, yellow or red-tinted window glass to keep flies out of butcher shops has proved successful both in England and in Holland. In tests flies are found to prefer white light to any color. Insects confined in cylinders of colored glass provided with one end of clear glass always move away from the colored glass end.

MOTOR MECHANICS

Edited by RAY F. KUNS

Fitting GASKETS Correctly is an ART

AS INDICATED by the arrows on the photograph below there are a large number of points about the engine which must be made tight. Usually gaskets of one form or another are used to seal these joints. When rebuilding the engine or repairing some unit, the old gaskets are frequently destroyed, and new ones must be installed. The methods indicated in the drawings will be helpful in making and fitting gaskets.

Ordinarily heavy wrapping paper makes a very good gasket. All materials for gaskets are sold through the regular trade channels. These are especially prepared to resist oil, water and gasoline.

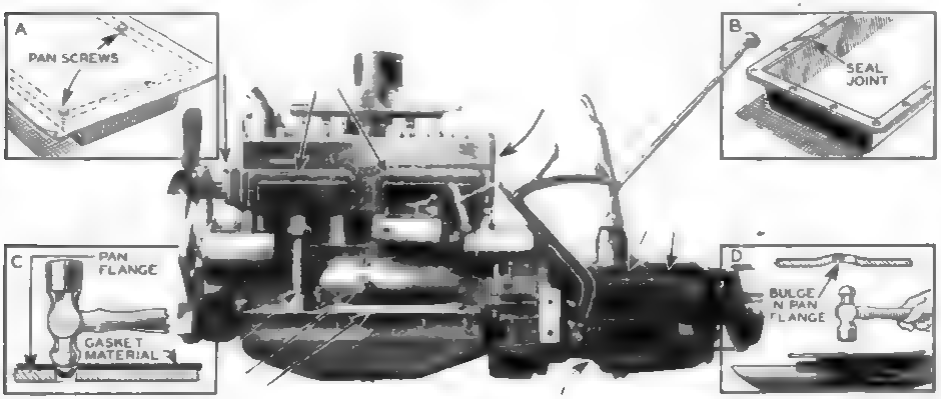
The oil pan is always removed when doing any work within the crankcase. Usually the gasket needs to be replaced. When making a new one for the pan, select a piece of paper or gasket material large enough to cover the pan nicely, after which locate two or three holes and punch out the gasket material and drop in cap screws to hold the material in position while completing the marking. This method is indicated at A.

With the material over the pan, use the fingers to run around the edges of the pan flange. This will leave a very nice mark to be trimmed with the scissors a bit later. Before trimming to the lines, use the hammer as shown at C to locate and drive out the material over the screw holes. A steel ball under a hammer does nicely for this work. After all holes are punched proceed to trim to the line and the gasket is complete and in nice order. If you have trouble keeping the gasket in position when installing the pan, it may be tied at one or two points with a bit of soft cord.

When making gaskets for the crank pan, always use the same thickness of material which was installed originally. This is especially necessary if the oiling is a splash system as in the case of the Ford Models T and A, the Chevrolet 6, the Hudson and others. If too thick a gasket is used the engine may be starved.

When installing cork gaskets, as indicated at B, you will find they are usually made with beveled joints. See that these ends come together in a nice fashion. It is a good plan to seal a joint such as this with gasket material, such as the Form-a-Gasket.

The oil pan which has been drawn up tight will have bulges drawn under the screw holes, as shown in the section of a pan at D. Where this is the case the bulge will strike the new gasket and the gasket material, be-



The arrows on the photograph point out the parts of the engine which must be sealed with gaskets. The four drawings illustrate several handikinks to be used, according to the text, in fitting gaskets.

tween the holes, will not be pinched tight. Leaks will occur. Place the flange of the pan over the anvil or other straight metal surface, as shown at D and drive out the bulge. If a slight bulge is induced in the reverse direction, this is not objectionable as the tightening of the screw will draw it out.

Gasket Material in Tubes

A very convenient package to have in the home garage or in the service garage is a tube of gasket material, such as Form-a-Gasket. This material may be used for a great variety of joints when sealing them against the loss of oil, gasoline, grease or water.

When small leaks will develop around the gasket a bit of the Form-a-Gasket will cure this trouble. The cylinder gasket may be giving trouble with reference to water leaks and the application of some of the gasket material at the troublesome point will help. When oil leaks will occur, treat the edge of the gasket and the parts with Form-a-Gasket.

There are a great many positions about the car where grease tends to leak. Some of these are indicated by the arrows around the transmission. Treating with gasket material will seal against leaks. Similar leaks may occur around the steering gear and the flanges in the rear axle, where the oil slingers and oil catchers are bolted against metal surfaces.

Reading the Battery Hydrometer

WHEN reading the hydrometer in the winter, it must be remembered that the actual reading is not necessarily the true specific gravity of the battery solution. The hydrometer is made to give a true reading at 70°. The rule is to add or subtract one point of hydrometer reading for each 3° above or below 70°.

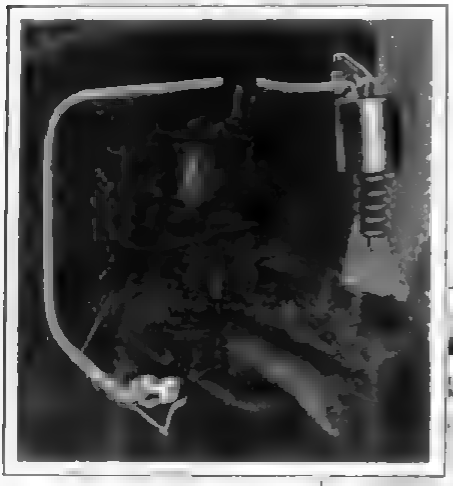
For instance, if the battery on charge shows a temperature of 100° the hydrometer correction would be 10 points added. If the battery is near the freezing point and shows a reading of 1.250, the actual reading would be 1.238.

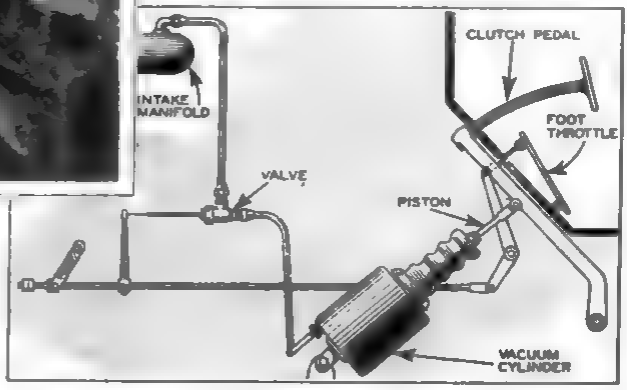
Bendix Vacuum Clutch Control

NO LONGER is it necessary for the driver of any motor vehicle accelerated by a foot throttle to even think of touching the clutch pedal when he wants to start, stop or shift gears. The device illustrated below automatically disengages the clutch when the driver lifts his foot from the accelerator, and engages it the moment the accelerator is again depressed.

Automotive engineers claim the device is as important as the self starter and four-wheel brakes and predict it will be but a short time until it will be built into all motor vehicles the same as the starter.

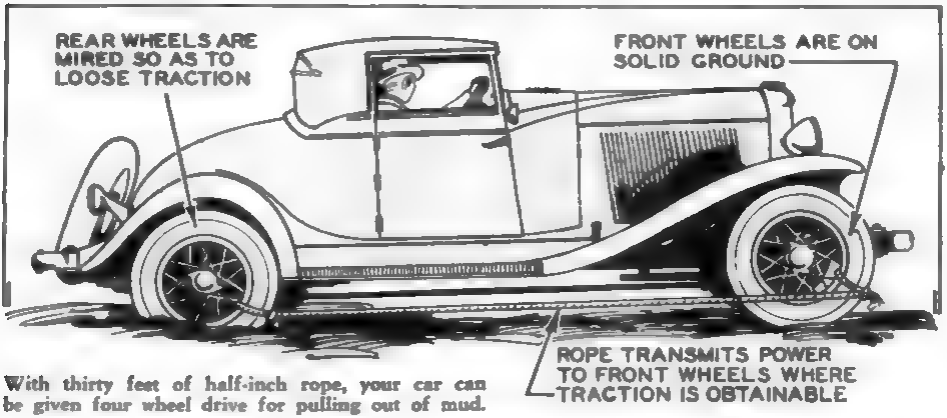
The clutch control system operates by a vacuum created by waste power from the intake manifold the moment the driver takes his foot from the accelerator. This vacuum draws a piston which in turn pulls down the clutch pedal, disengaging the clutch. Gears can then be shifted. The vacuum is dissipated the instant the accelerator is pushed down. This releases the piston and the clutch pedal comes up automatically and smoothly.





Above is the clutch control installation on a Ford, showing the valve connected to the manifold and tube leading to the vacuum cylinder. The diagram at the right shows the principle of the clutch control which is operated by the releasing foot throttle.

Emergency "Four Wheel Drive" Pulls Car Out of Mud



With thirty feet of half-inch rope, your car can be given four wheel drive for pulling out of mud.

ANY motorist who carries thirty feet of good half-inch rope in his car should not worry over the possibilities of getting stuck in a mudhole while traveling across country. When one or both the rear wheels begin to spin, stop your motor, get right out, and attach the rope as shown in the illustration.

Start your motor and ease the clutch in gently in *low*. If the rope is attached tightly —on both sides of the car—you will move forward about eighteen inches. The rope then has to be re-tied to the wheels, and the same procedure repeated till clear of the mire.

This method makes a four wheel drive of your car and is positive in its action. The re-tying of the rope each eighteen inches will probably be a little messy, but there are few who will balk at this when such an easy way to get out presents itself. It takes about fifteen feet of rope on each side.

The Red Spot Means Something

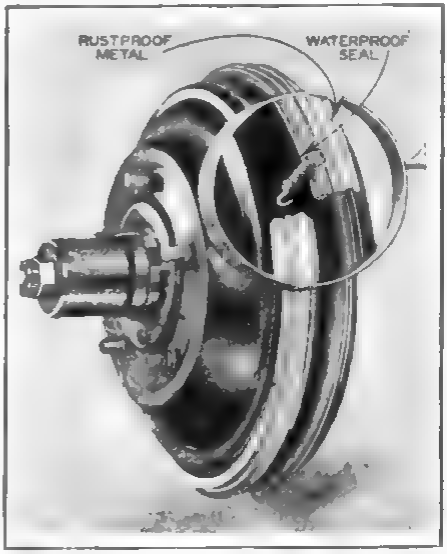
TIRE manufacturers place a red spot or indicating mark on their tire casings. This mark shows that this point is the lightest part of the casing. Now if you will install the inner tube with the tube stem at this point you will balance or offset the extra weight which is in the heavy side of the casing, so that the tube and casing are in approximately perfect balance when assembled on the rim. This will prevent shimmying and tramping of the front end.

If your car has been performing properly with old tires and has a case of shimmy or tramp when new tires are installed, you may suspect that they are out of balance.

Sealed Brakes Prevent Scoring

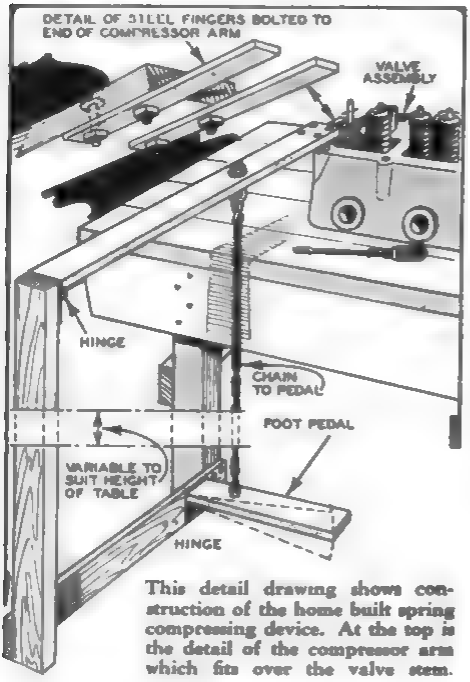
YOU no longer have to gamble on whether or not your brakes will hold when danger looms ahead, for a safety brake seal may now be obtained which fits tightly over the standard brake drum and housing like a tight-fitting glove, keeping out all water, dirt, grease and grit, which destroy braking efficiency.

In installing, the wheels are removed, the surfaces of the brake drum are thoroughly cleaned, and the seals are slipped on and clipped into place.



The life of the brake lining is doubled by installing these safety brake seals all around.

Making Your Own Valve Spring Compressing Device



This detail drawing shows construction of the home built spring compressing device. At the top is the detail of the compressor arm which fits over the valve stem.

Do Not Polish Through Lacquer

THE pyroxylin lacquer used for finishing automobiles is subject to polishing so as to bring out a luster equal to the original appearance of the job when it came from the factory. This is true as long as any of the original lacquer remains.

Lacquer is applied to the car body in successive coats. The better the job the more coats of lacquer. Every one is familiar with the car which has a spotted appearance. This appearance is usually due to the fact that continuous polishing of the car has worn through the lacquer and the undercoating is showing.

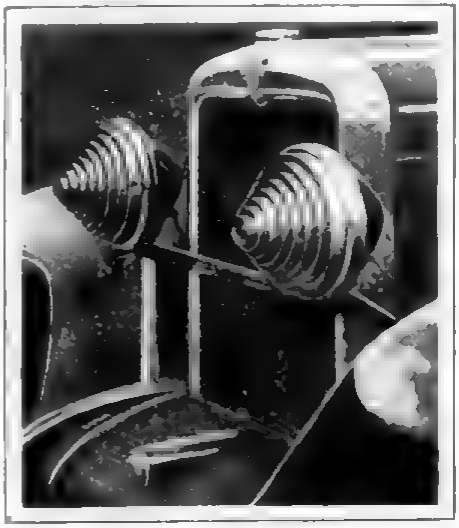
Preparations used for polishing are of two types. The one type "cuts" the lacquer, as is evidenced by the discoloration of a white cotton cloth when used to polish. The other type contains an abrasive and this will wear away the body of the finish. It is a good plan to clean and polish a car body two or three times each year. After polishing, treat it with a good wax or body polish and then for several months do not repeat the original cleaning and polishing process. Where this method is followed the car will be kept in fair condition and the finish won't be cut through.

IT IS not always easy to exert enough pressure on the valve spring of the overhead engine, to compress it and hold it compressed while removing the pin or other locking device. This work may be expedited in the home garage with a device such as is illustrated herewith. This is made from strips of crating or other wood which may be found about the garage.

A 2x4 is cut to a height just equal to the top of the cylinder head as it lies in position on the bench top. Two steel fingers are screwed to the under side of a cleat, which is then nailed to one end of the 2x4. Foot pressure is used to compress the valve spring, thus leaving both hands free to disassemble or assemble the job.

Light Control Headlight Fixture

A LIGHT and fog control fixture for automobile headlights has been invented by D. R. Dye of Bonner Springs, Kansas. The light from this device penetrates fog and dust clouds so that a speed of 50 miles an hour is possible under such adverse conditions, whereas it would otherwise be necessary to slow down to 10 or 15 miles. It also enables the driver to see farther to each side. The device is composed of eight pressed steel bands put together on the same order as the retinal rings in the human eye.



Being rayless, these lights, shown above, permit the driver to see the road beyond an approaching car.

Things to Make with Tools

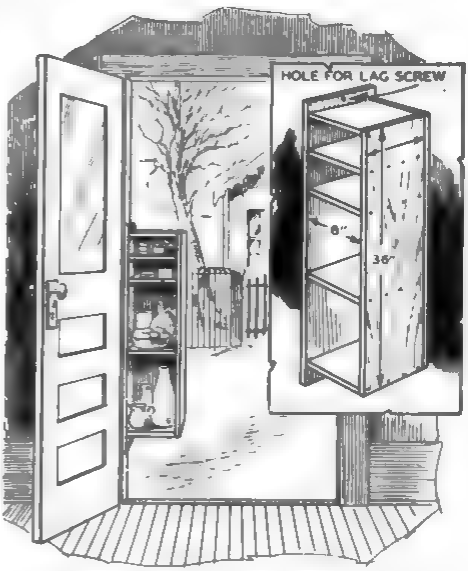
Edited by A. NEELY HALL

A Doorway Winter REFRIGERATOR

IN SOME respects, a doorway refrigerator is more satisfactory than one built for a window sill. It is necessarily narrow, since it must not obstruct the doorway, but it is plenty wide to accommodate milk and cream bottles, butter, small plates and other containers. It fastens to the hinge-jamb of the doorway, which, if you will notice is not much used for passage, especially in cold weather when the door is not swung full open. With the cupboard faced to the door, it is not accessible from without when the door is closed and locked.

The detail suggests how to build the box. Alter the given dimensions as you see fit. Make the jamb side long enough to project about 1½ inches above the box, and 1½ inches below, and bore holes through the projecting ends for lag screws for attaching to the door jamb.

Any number of shelves may be used, depending upon the amount of food you want to keep cold. A satisfactory location for each board is suggested in the accompanying drawing. All parts should be cut from ¾ or 1-inch material. Heavy two-inch wood screws are best to support the entire case.



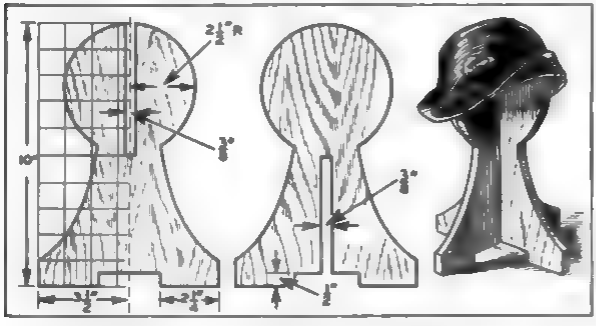
Winter refrigerator is constructed as shown in drawing, and lag-bolted to door jamb, facing in. Width is sufficient to accommodate number of containers of milk and butter.

Knock-down Rack Keeps Milady's Hats in Best Shape on the Closet Shelf

THIS individual hat rack is just the thing for present styles of headgear. It may be stood upon a closet shelf or table, or it may be knocked down and packed in one's trunk for traveling, if you like.

Three-eighths-inch plywood is best for the job. The accompanying drawing gives dimensions and shows the assembled rack. A power band saw or a jig saw will simplify the cutting of the pieces. Fasten together several thicknesses of plywood or other wood, place the cardboard pattern on top, and cut all at one time. True up the edges with a wood rasp, chisel and plane. Then smooth all surfaces with sandpaper, and round off the outer edges enough to remove their sharpness.

Lacquer makes an attractive finish for racks of this type.



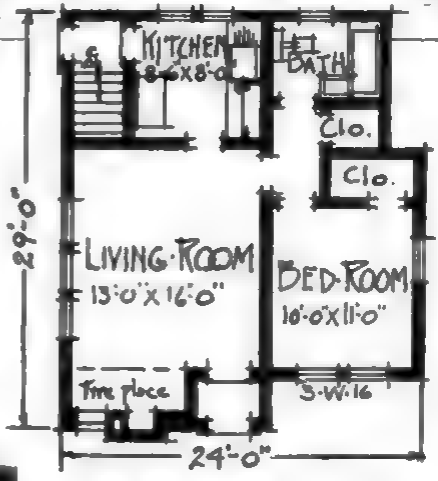
Two pieces of rack are slotted and assembled as at right.

It's BARGAIN TIME for

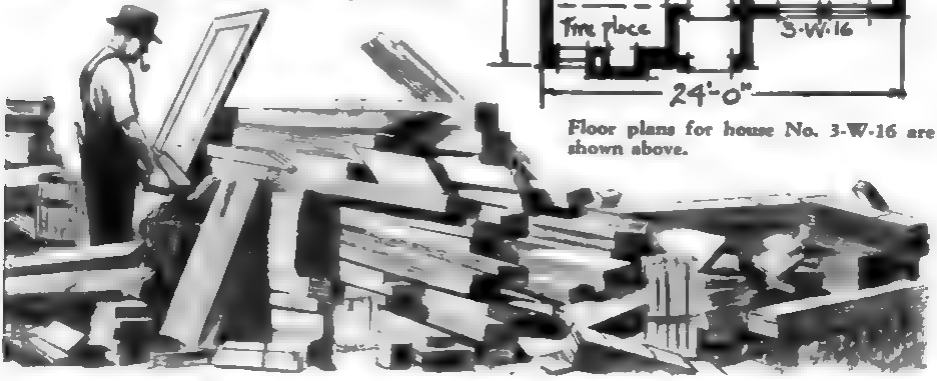
Ideal for newlyweds is this tabloid type house built from plans 3-W-16, embodying kitchenette idea, but complete with all modern conveniences.

IT'S NO secret. The building industry has been hit hard. Real estate, materials and labor are on the bargain counter. It's a buyer's market. If you've laid away a little cash and are waiting for the time to come when a dollar will do the work of two, now is your opportunity.

Wise investors, therefore, are picking up choice building sites at their own prices and



Floor plans for house No. 3-W-16 are shown above.



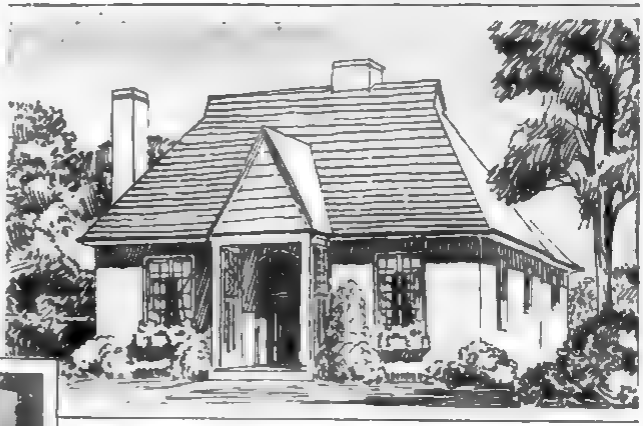
Construction costs and time are greatly reduced by use of this ready-cut and ready-to-fit material.

Home Builders

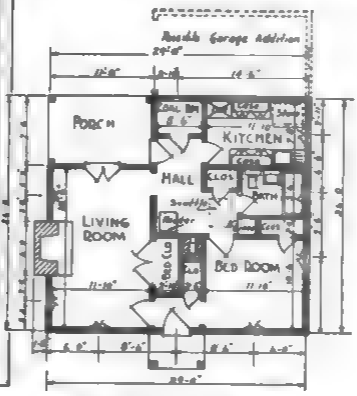
by MAURICE I. FLAGG
Director, Small Homes Bureau

HOW TO GET A BLUE PRINT AND TWO PLAN BOOKS

A one-sheet blue print of any house appearing in Modern Mechanics and Inventions magazine may be had for $1.00, postage prepaid. Two new plan books, "Homes for Newlyweds," containing 32 of the latest ideas for low cost homes in all styles, and "16 Selected Homes for Loan Purses" containing time, space, and labor-saving bungalows, may be had for 15 cents each, or both books for 25 cents, postage prepaid. Address Home Building Editor, Modern Mechanics and Inventions Magazine, Minneapolis, Minn.



House No. 3-S-1 suggests French urban style, having studio living room with fireplace and enclosed rear porch.



FIRST FLOOR PLAN

Above—For small houses disappearing stairs save time, space and labor.

Right—First floor plans for house No. 3-S-1, shown in top photo. Blue prints may be had by mailing $1.00 to Modern Mechanics and Inventions Home Building Editor, 529 South Seventh Street, Minneapolis, Minn.

What happens to money put into home building? Where does it go to? What do you get for what you pay? These are questions most folks want answered before they start their journey to happy homeland.

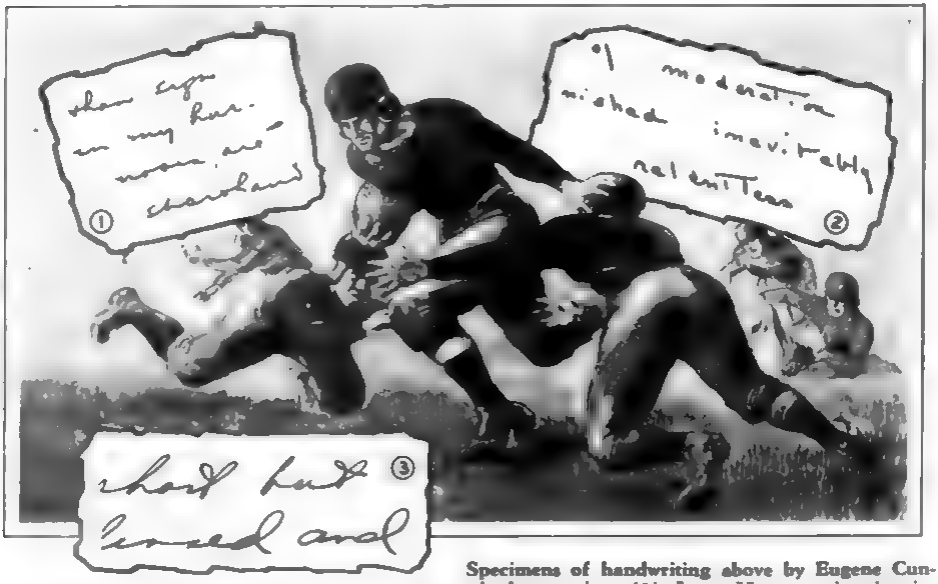
In many cases as much as 50 per cent goes for labor. A recent chart of a carpenter's working 10 hour day shows that often he spends 40 per cent of his paid time getting lumber measured, trimmed and ready to put up. Thus you have both wastage of time and materials to pay for, and that piles up into a small mountain of money. How many houses have you seen under construction where short ends of lumber were strewn helter skelter about the place? Waste in materials and time therefore is one of the big items on every job. In home building, if you are concerned with utmost economy you must shop around and select part by part, fit them together, absorb the expense for wastage and loss of time. Delays in getting work-

letting building contracts. Like the Marshall Field Company of Chicago and others going ahead with big construction, many are taking advantage of present rock bottom prices, knowing that rentals later will pay them a handsome profit due to the purchasing power of the present dollar.

In other words the present market is not a speculation or a gamble. It's a buyer's chance and almost as safe a bet as the solidity of the U. S. Government. Home builders who have the courage now to go ahead may see their money double in a few years.

(Continued on page 168)

Free Analysis of Your Handwriting



Specimens of handwriting above by Eugene Cunningham, writer, (1), Larry Hogan, swimming instructor, (2) and Channing Pollock, dramatist (3), all show determination and persistency. What does your handwriting show? For a free analysis send a specimen to M. N. Bunker, care of Modern Mechanics.

THAT there is no letter in the alphabet more revealing than the small letter "t" is a fact determined by M. N. Bunker, world famous grapho-analyst, whose work brings him specimens of writing from every part of the globe.

This "t" which is written much like the figure "&", as in specimen No. 1 above, shows remarkable persistence. It shows that the writer finishes what he starts, that he does not know when he is whipped. This was what Mr. Bunker told Eugene Cunningham, western story writer, when he examined this specimen written by Mr. Cunningham.

"You've called the turn on me," the writer said, admitting that when he starts to do a thing he intends to finish it.

On the other hand the "t" shown in specimen No. 2, which is the writing of Larry Hogan, swimming instructor, indicates the same characteristic. This "t" is tied in a knot which indicates attention to details until the very finish.

An entirely different story is told by specimen No. 3, which is the writing of Channing Pollock. This "t" proves that the writer is a builder of air-castles, but he is so thoroughly sure of what he wants to accomplish that he puts his purposes within the range of the possible, rather than permitting them to be mere shadowy hopes.

There is will power too in this last "t", shown by the strength of the cross-bar written above the stem of the letter. This will power also helps to make the ambitions of the writer more certain.

Intimate details of your character are shown not only by the way you make your "t's" but in the way you make other letters as well. You learn something of what your handwriting says about you by having it analyzed by Mr. Bunker. If you are in business and have need to know the characters of your associates or customers, you will find a handwriting analysis of them of great value. Whether they are reliable or not will be plainly revealed.

Your latent powers and talents, as revealed by your handwriting, will be analyzed for you free if you will send a stamped, self-addressed envelope, together with a specimen of your handwriting, to M. N. Bunker, care of Modern Mechanics and Inventions, 529 So. 7th St., Minneapolis, Minn.

SPLIT THE AIR *Like a Rocket!*

FLASHING acceleration — from start to full speed in a few seconds — is a motorcycle thrill that only a "rocket motor" could equal.

Just ride a 1932 Harley-Davidson and feel what real pick-up is. See how it shoots you away from tangled traffic. You are down the road, safe and clear, before cars are really rolling. Then the whole countryside is yours — for swift jaunt or long tour. And motorcycling costs so little!

Look over the 1932 Harley-Davidsons at your nearest dealer's. See for yourself how little they cost — at the new reduced prices — and what a convenient Pay-As-You-Ride Plan he has.

$199—at the factory—is the low price of the Harley-Davidson Single, a new model for 1932. It's a completely equipped motorcycle, with 3-speed transmission, full electric equipment and all. Wonderful value.

Ride a **HARLEY-DAVIDSON**

MAIL THIS COUPON

Harley Davidson Motor Company
Dept MM, Milwaukee, Wis.
Interested in your motorcycles. Send Literature.
Name .....
Address .....
My age is ☐ 16-19 years, ☐ 20-30 years, ☐ 31 years and up, ☐ under 16 years.
Check your age group.

DICK GRACE

I Am Still Alive

by DICK GRACE

Cheating death by careful planning, coolness, and quick thinking is Dick Grace's occupation. Professional crack up engineer for the movies, he has intentionally crashed 34 airplanes for such pictures as *Lilac Time*, *Wings*, *Young Eagles* and many more.

Here is Dick Grace's own story of how it is done and how it feels to do it. Breath-taking thrills—true adventures!

"Tremendous reading," says Paul Snell of Paramount-Publix Corporation.

Illustrated with actual photographs of crashes

AT ALL BOOK STORES
$2.00
OR FROM THE PUBLISHER AT $2.07 POSTPAID

RAND McNALLY & COMPANY
CHICAGO
[illegible]
SAN FRANCISCO

BASHFUL?

Shame on you! Are you nervous, embarrassed in company of the other sex? Ring being shy of strangers. Conquer the terrible fear of your superiors. Be cheerful and confident of your future! Your looks, easily overcome so you can enjoy life to the fullest. Send 25c for the amazing book.
RICHARD BLACKSTONE, D-3212 FLATIRON BLDG., N. Y. C.

GIVE SILK HOSE FREE!

Clear up to $40 Cash Profits Daily

Make big money giving 100% Pure Silk Hose *Free!* Rivals $2.50 value. Given *Free* with exquisite Perfume and Powder set, equal charm of $6 val., *at only $1 complete!*

100% PROFIT FOR YOU WITH PARIS TOILETRIES

Rapid Sight-seller! Big Repeat Sales! You clean up *$40-$50 daily* from the start!

"Quality and Service Since 1910"

Sample, Only $1

Act Now!

AGENTS! Get our amazing offer. Start Making Big Money. Write today.
PARIS LABORATORIES
3147 Locust Bl., Dept. 1121A, St. Louis, Mo.

Bargain Time for Home Builders

(Continued from page 165)

men on the job are costly. So it's not difficult to understand why many people get discouraged even with a small house. And why they expect more for their money in service, size and comforts than they sometimes get.

Years ago I listened to the promotion manager of a large lumber industry forecast a ready-to-use future for home builders. He pictured a home building store like a large department store located in the center of a big city. Prospective home builders could walk into the store and be routed, cafeteria style, from counter to counter to purchase a home complete under one roof in the style, size and equipment to fit any size pocketbook. He could leave the store with the keys to his future home in his pocket along with a promise and guarantee that at the end of 30 days his new home would be ready to use and complete even to food in the ice box and heating plant in operation. Nothing at all to worry about except keeping the financing plan in operation for final pay-off and complete ownership.

Since that time such things have actually happened. Manufacturers are now putting up package lumber finished and made ready to cut without waste and for accuracy in construction. Others prepare complete house at the mills, ready for shipment anywhere and guaranteed as to quality and money savings. You may order a house today almost as you order a car, cut to fit and almost ready for use. As time goes on it may be possible for you to order your new home in the morning, and have it delivered in the afternoon completely furnished, financed, and landscaped. All of which may sound a bit futuristic but I've heard an executive high up in the construction industry predict it. The future certainly holds great promises for home builders, but there's no greater promise than the present one, namely: that prices are low and you can build or buy much more for each dollar than you will be able to five years hence. These are bargain days.

I have chosen two houses this month, tabloid types, as examples of small homes, extremely small places, but large in comfort, service and style. Normal rent money of $25 to $30 per month should handle them. They are flexible in plan, and may be added to later, and the cost to build low.

Plan No. 3-W-16 duplicates an efficient

Bargain Time for Home Builders

kitchenette apartment. It's an admirable place for young folks starting life and older people whose children have married and left home and don't want to be burdened with a big house.

There's a living room with fireplace, a bedroom, kitchen and bath. A triple window in the living room is a feature. You can build the house without a basement. An upstairs heater will keep you warm. Two windows may be substituted for the fireplace. A large closet in the bed room will accommodate a roller type bed. This would permit bedroom and living room to open into one large room. A porch added to the front of the house would make a desirable summer cottage in skeleton construction for a lakesite. The house is frame construction, siding exterior and shingle roof.

According to the designer from $2500 to $3000 is the suggested price range, possibly less. If you are ambitious you can do considerable of the work yourself. That would save money.

Plan No. 3-S-1 offers a studio living room with fireplace and either an open or enclosed porch to the rear. The house suggests French urban style due to the high pitched roof lines. Construction is frame with stucco finish or it may done in siding. Aside from the living room, in which a special closet has been provided for concealing a bed, there's a bedroom, bath and kitchen. An upstairs heater is contemplated and space has been reserved for fire storage as well as heater. The plan shows a garage addition may be made. This house according to the designer runs about the same in suggested cost as the other—from $2500 to $3500, depending upon materials, equipment and where the house is built.

Both are as compact in plan as possible. Both offer renters of small apartments an opportunity to enjoy the same equipment in a home of their own and with rent money applied on purchase so reasonable that most anyone can afford it.

Both are built from stock materials. Hope you like them.

Rubber Band Fixes Small Springs

SMALL springs, such as those which operate the movable contact points in the distributor head may break and the points cease to function. A rubber band may be hooked over the points as a temporary repair.

"Seldom see an I.C.S. graduate OUT OF A JOB—"

"In all the years I have known of the International Correspondence Schools, I have seldom seen one of your graduates out of a job."

A business executive made this statement in a recent letter commenting on the I. C. S. graduates and students in his employ and expressing regrets that it is necessary to reduce the personnel of his organization.

"However," he added, "all I. C. S. graduates and students will be retained, for I realize their value in the conduct of my business."

The reason I. C. S. men always have jobs is because they are *trained men!* You, too, can be an I. C. S. man. In this age of efficiency and specialization, to be an I. C. S. man means security for the present and assurance for the future.

Mark the subject in which you are most interested. Mail the coupon *today*. It has been the most important act in thousands of men's lives!

INTERNATIONAL CORRESPONDENCE SCHOOLS
"The [redacted]"
Box 2316-N, Scranton, Penna.

Without cost or obligation, please send me a copy of your booklet, "Who Wins and Why," and full particulars about the subject *before* which I have marked X:

TECHNICAL AND INDUSTRIAL COURSES

☐ Architect	☐ Automobile Mechanic
☐ Architectural Draftsman	☐ Plumbing ☐ Steam Fitting
☐ Building Estimating	☐ Heating ☐ Ventilation
☐ Wood Millworking	☐ Sheet Metal Worker
☐ Contractor and Builder	☐ Steam Engineer
☐ Structural Draftsman	☐ Steam Electric Engineer
☐ Structural Engineer	☐ Civil Engineer
☐ Electric Wiring	☐ Surveying and Mapping
☐ Electrical Engineer	☐ Refrigeration
☐ Electric Lighting	☐ R. R. Locomotives
☐ Welding, Electric and Gas	☐ R. R. Section Foreman
☐ Reading Shop Blueprints	☐ R. R. Bridge and Building Foreman
☐ Telegraph Engineer	☐ Air Brakes ☐ Train Operation
☐ Telephone Work	☐ Highway Engineering
☐ Mechanical Engineer	☐ Chemistry ☐ Pharmacy
☐ Mechanical Draftsman	☐ Coal Mining Engineer
☐ Machinist ☐ Toolmaker	☐ Navigation ☐ Boilermaker
☐ Patternmaker	☐ Textile Overseer or Supt.
☐ Pipefitter ☐ Tinsmith	☐ Cotton Manufacturing
☐ Bridge [redacted]neer	☐ Woolen Manufacturing
☐ Bridge and Building Foreman	☐ Agriculture ☐ Fruit Growing
☐ Gas Engines ☐ Diesel Engines	☐ Poultry Farming ☐ Radio
☐ Aviation Engines	☐ Marine Engineer

BUSINESS TRAINING COURSES

☐ Business Management	☐ Business Correspondence
☐ Office Management	☐ Lettering Show Cards ☐ Signs
☐ Industrial Management	☐ Stenography and Typing
☐ Personnel Management	☐ Complete Commercial
☐ Traffic Management	☐ Civil Service ☐ Mail Carrier
☐ Accountancy ☐ Cost Accountant	☐ Railway Mail Clerk
☐ C. P. Accountant	☐ Grade School Subjects
☐ Bookkeeping	☐ High School Subjects
☐ Secretarial Work	☐ College Preparatory
☐ Spanish ☐ French	☐ Illustrating ☐ Cartooning
☐ Salesmanship ☐ Advertising	☐ Lumber Dealer

Name [redacted] Age [redacted]

Address [redacted]

City [redacted] State [redacted]

Occupation [redacted]

If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada

NO MORE BIG TIRE BILLS!

GOODYEAR · FISK · Firestone · U.S. AND OTHER MAKES

At ¼ Regular Prices

These You Know and Prefer AT NEW LOW PRICES!

You can rely upon Chicago's oldest and most reliable rubber company to deliver tire mileage at lowest cost. Actual tests on the worst roads in the country prove that our standard brand, reconstructed tires deliver 50 to 60 per cent more service. A trial order will convince you.

BUY NOW — 12 MONTHS SERVICE GUARANTEED — SAVE MONEY

BALLOON Tires

Size	Rim	Tires	Tubes
29x4.40-21"		$2.30	$1.10
29x4.50-20		2.40	1.15
29x4.50-21"		2.45	1.20
30x4.50-19"		2.45	1.20
30x4.50-21		2.90	1.35
30x4.50-20"		2.90	1.35
30x4.50-19"		2.95	1.35
31x4.50-21"		2.95	1.35
31x4.50-20"		2.95	1.35
32x4.50-20"		3.20	1.40
31x4.00-19"		3.20	1.40
32x4.00-20"		3.20	1.40
32x4.00-21"		3.20	1.45
32x4.50-20"		3.65	1.75

Reg. CORD Tires

Size	Tires	Tubes
30x3	$2.30	$1.00
30x3½	2.35	1.00
32x3½	2.45	1.10
31x4	2.90	1.25
32x4	2.90	1.25
33x4	2.95	1.25
34x4	2.95	1.25
32x4½	3.20	1.40
33x4½	3.20	1.40
34x4½	3.20	1.40
35x5	3.65	1.75
33x5	3.65	1.75
34x5	3.65	1.75
All Other Sizes		

DEALERS WANTED

All Tubes New—Guaranteed First Quality

Send only $1.00 deposit with each tire ordered, balance C. O. D. If you send cash in full deduct 5 per cent. You are guaranteed a year's service or replacement at half price.

MIDLAND TIRE & RUBBER COMPANY

Dept. 1723, 1000 to W. Sixty-Third Street Chicago

LEARN WATCH REPAIRING

You can learn by our modern and original system of instruction every part of the Watch Repairing Trade at home as good or better than at a shop. You can earn money while learning and secure a well paying position or start in business after completing our course of instruction. Good watch repairers are always in demand and earn from $50 to $75 per week. For particulars apply to the

Wisconsin School of Watch Repairing

834 E. Mason St. Dept. C Milwaukee, Wis.

WHAT A MAN!

Health, wealth, and happiness gravitate toward the man who can play a Buescher Sax. Gives you the chance to enjoy all the pleasures of life. So easy to learn, too, on a Buescher. Many master scales the first hour; play tunes in a week; join a band or orchestra in 90 days. But only with a Buescher is this rapid progress assured. Go now, to your local Buescher dealer. See the new models. Try them. Arrange to take one home on trial. Or send a postal for beautiful catalog. Easy terms. Get started now with a Buescher. 166

BUESCHER

Buescher Band Instrument Co., 1215 Buescher Block, Elkhart, Indiana

TEAR GAS

PROTECTION for Stores, Warehouses, Homes, Summer Camps, Automobiles, Trucks, Garages, Filling Stations, Etc. New automatic electrically sound sealed Tear Gas Devices give SAFE and SURE Protection against Burglary, Theft and Holdup at small cost. Easily and quickly installed anywhere

AGENTS Property MUST be protected this year. Business is booming NOW. High grade ambitious financially responsible men can make exceptional earnings with this complete protection line. No competition. Exclusive territory. Quick sales. Splendid profit margin. Write today for details.

E. R. & S. CO. 64 E. Lake St. Dept. 123, Chicago

Auto Contest Prize Winners

(Continued from page 105)

Glendale, N. Y., wins the third prize of $25.00 for a car which cost just that amount to build. It is also constructed of parts picked up from local junk dealers and is powered with a one-cylinder Indian motorcycle motor which develops four horsepower for a top speed of forty miles an hour.

The chassis is made of oak braced with angle iron. The front springs are semi-elliptic and are made from a single spring leaf from an old car of unknown vintage. The rear springs are semi-cantilever and are of a highly original design. Bicycle wheels are used, with special hubs to take a one-half inch axle. The car is chain driven, and the motor and transmission are mounted on ½" pipe so that none of the pulling power falls on the chassis.

The steering wheel is from a Model T Ford, with a universal joint in the steering column to enable the driver to get in and out easily. The body is made of heavy tin supported by a steel frame. The motor is started by a kick starter and is cooled by a belt-driven fan. The clutch is worked by a hand lever at the right, the brakes and throttle by foot, while the hand shift is between the driver's knees. Gas and oil tanks are mounted back of the fire dash under the hood.

All of the first three prize winners have promised to draw up complete plans for building their cars; and if these plans prove satisfactory they will be passed on to our readers through the pages of MODERN MECHANICS AND INVENTIONS.

Five prizes of $5.00 each were also awarded. A comparison of the pictures of the major and minor prize winners might lead you to believe that the awards should have been reversed, for most of the five dollar winners seem to have turned out better jobs than those who drove off with the important money. Well, that's just the trouble. Their jobs are too good and cost too much.

Take, for instance, that nifty little "Silver Bullet" racer shown in the center of page 105. Although Mr. Borntraeger doesn't mention the price, we'll wager it cost plenty. It's powered by an Indian 4, mounted backwards to turn the front wheels, and does 80 miles an hour. The body is entirely of aluminum with the usual machined design overall.

Then there's that midget racer built by J. Herman Pehrson. It is 18 inches at the high-

est point, has a 24 inch tread and a 44 inch wheelbase. It is a front drive with a home-built motor, the whole job being originality itself. But it didn't get in the big money because the editors didn't believe it to be the kind of car the average amateur builder would care to undertake. Just another case of being too good.

That Henderson-powered racer by Huber Wittman is another excellent job which cost only $185.00. You'd be surprised to know how close he came to getting one of the bigger prizes. Robert and Richard Kern, whose car is shown in the upper right hand corner, were also hard to push down among the five dollar prizes, for they turned out a honey for only $68.40. We'd like to get complete plans for that bus.

Gardner Turman of Boulder, Colorado, no doubt took us seriously when we said we wanted midget cars, for the job he turned out is really a glorified roller-skate. It's certainly a rugged and workmanlike job for a 16-year-old boy, but again, it seems hardly the type of bus that most of our readers would want to buzz around in.

NOW ON SALE—

The NEW 1932 Edition of

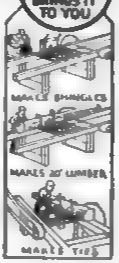
The FLYING and GLIDER MANUAL

(Turn to page 179 for full description)

Price 50 Cents at all News Stands

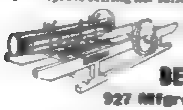
ONE-MAN SAW MILL $39 BRINGS IT TO YOU

Makes lumber, shingles, cross ties, fence posts, lath, fruit and vegetable crates and boxes, dimension blanks for furniture, etc. Splits blocks into firewood. Needed by farmers, timber owners, contractors. Pays for itself in a week, or on one job. Guaranteed. Sold direct from factory.



M. Crane, Missouri, writes: "Have so many orders for lumber and shingles will be busy several months. "Already have orders for 100,000 shingles and equal number saw handles."—J. J. Sorrels, Texas. "The orders for lumber are now coming in very fast."—R. M. Hobbs, Maine. "Saw 3,000 feet of lumber a day, also 9,000 shingles and 8,000 lath in one day."—A. F. Roberts, Calif. "Am building barn 58' square of lumber sawed with Belsaw."—F. O. Hamlin, Puget Sound.

Now, Make Big Money with this lumber making machine. Have fine lumber business of your own. Make big money. No selling nor soliciting. Write today for Special Low Factory Prices and Free Book, "How to Make Lumber."



BELSAW MACHINERY CO.
927 Mfgrs. Ex. Bldg. Kansas City, Mo.

Genuine BRAND NEW CORONA Model No 3 at NEW LOW PRICES

Now Only $39.90 or on Easiest Terms Ever Offered (SMALL CARRYING CHARGE)

Yours for Only $1.00 DOWN

Hurry! If you want to be in on the biggest "BUY" in Portables. Only a very limited number of these Brand New Coronas available at this *Special Low Price* and *Easy Terms*. Don't wait. Here's your chance to get a wonderful nationally advertised Corona at a *real bargain*. Has up-to-date improvements and carries our regular New Machine iron-clad guarantee. Remember this exceptional offer good only while supply lasts.

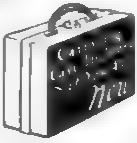
Sent On 10 Days Trial!

Send for your 10 days' trial of this new Corona Now. Try it the entire time at our risk. See for yourself the neat, smooth, perfect work it does. Note how easy and quiet it runs. Learn the joy and convenience of writing on a portable. Write all your personal and business correspondence during our generous trial—without obligation to buy. Compare its many improved features—its neat, compact and sturdy design, its superior workmanship, and its bright sparkling finish with other machines costing much more.

Iron-Clad Guarantee

Act At Once—only $1 brings this shiny new Corona for full 10 days' trial—Write all the personal and business letters you want. If you decide to keep it send only $3 a month until the special low price of $42.90 (term price) is paid.

FREE Carrying Case



Beautiful Leatheroid carrying case with nickel trimming is included Free with each Corona while limited quantity lasts. If you have ever wanted a wonderful portable—here's your chance. Don't wait until it's too late. Send the coupon NOW.

LIMITED OFFER—At this Bargain Price and unheard of easy terms—10c a day—these wonderful New Coronas will go in a hurry. Remember the Corona comes to you fully complete—book of instructions and all—nothing extra to buy. Send at once!

International Typewriter Exchange (Corona Division)
231 W. Monroe St., Chicago Dept. C-1220

Send the Corona F.O.B. Chicago for 10 days' trial at the special low price offered. I enclose $1.00 deposit with the understanding that if I am not perfectly satisfied I may return it Express Collect and get my deposit back. If I decide to keep it, I will send $3.00 a month until I have paid $42.90 (term price) in full.

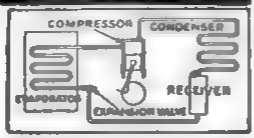
Name ..... Age ...

Address ....

Town ..... State

NEW INDUSTRY NEEDS MEN

Electric Refrigeration Calls You!



NEWEST American industry needs plain, practical men for jobs paying up to $75 and $100 a week in production, service, installation and sales. Fast growing, big money field—backed by General Motors, General Electric, etc. New, easy home training fits you quickly in spare time. Endorsed by Kerrel Kelvinator and other manufacturers. Free employment service, 2 weeks' actual factory training without extra cost. Low fee, easy terms. Money back agreement.

FREE new book contains full details. Sent without obligation. Simply mail coupon NOW—no obligation. **UTILITIES ENGINEERING INSTITUTE, Dept. 6121, 4403 Sheridan Rd., Chicago**

OLD MONEY and stamps WANTED

POST YOURSELF! It pays! I paid J. D. Martin, Virginia, $200 for a single copper cent. Mr. Manning, New York, $2,500 for one silver dollar. Mrs. G. F. Adams $740 for a few old coins. I want all kinds of old coins, medals, bills and stamps. I pay big cash premiums.

WILL PAY $100 FOR DIME

1894 S. Mint; $50 for 1913 Liberty Head Nickel (not buffalo) and hundreds of other amazing prices for coins. Get in touch with me. Send 4c for Large Illustrated Coin Folder and further particulars. It may mean much profit to you. Write today to

NUMISMATIC COMPANY OF TEXAS
Dept. 90 FORT WORTH, TEXAS
(Largest Rare Coin Establishment in U. S.)

Will Grow Your Hair Or Cost Nothing

Before: Slavin at 45

Growing hair is now a science. Hair roots rarely die. They get clogged with dry alkaline and poisons and the hair shaft simply can't grow out.

Our treatment removes these and supplies nourishment. It has grown hair on thousands of heads and is guaranteed to grow hair on your head, stop falling hair, eliminate dandruff, and relieve itching scalp or refund will be made of every cent of your money. Don't suffer baldness or any abnormal scalp condition any longer. Send NOW for FREE information in plain sealed envelope without any obligation on your part.

After: Slavin at 68

SLAVIN INSTITUTE, Dept. AE, 737 Butler Bldg., San Francisco, Calif.

GOV'T. POSITIONS

$1LENDID SALARIES

MEN-WOMEN — AGE RANGE 18 to 50

WE HELP YOU GET ONE

( ) Ry Mail Clerk	( ) Stenographer, Typist
( ) P. O. Laborer	( ) Immigrant Insp.
( ) R F D Carrier	( ) Seamstress
( ) Special Agent	( ) Auditor
( ) Customs Inspector	( ) Prohibition Agent
( ) City Mail Carrier	( ) U. S. Border Patrol
( ) Meat Inspector	( ) Chauffeur
( ) P. O. Clerk	( ) Watchman
( ) File Clerk	( ) Skilled Laborer
( ) General Clerk	( ) Postmaster
( ) Matron	( ) Typist

Instruction Bureau, Dept. 233, St. Louis, Mo.
Send me FREE particulars "How to Qualify" for positions marked "X". Salaries, Locations, Opportunities, etc. ALL SENT FREE

Name .....
Address .....

Scientific Hoaxes Fooled the World

(Continued from page 87)

elephants and other ferocious animals, most of which were stated to be still at large when the article appeared. A cougar was reported to have entered St. Thomas Church, while a lion succeeded in boarding a ferryboat, stampeding the horses on board and causing many passengers to be thrown into the water. Several regiments of militia were alleged to be hunting the animals.

The whole city was in a panic over this lurid tale, notwithstanding the fact that the final paragraph of the article, which a majority of readers overlooked, admitted that it was a pure figment of imagination. The *Herald* subsequently defended the publication of the story by stating that its purpose was to direct attention to the unsafe condition of the buildings at the Zoo. It had the desired effect, as the buildings were soon afterward strengthened.

Another New York newspaper, the *Sun*, was responsible for the great Moon Hoax; probably the most celebrated exploit in the field of journalistic mendacity. The story, which was concocted by one of the *Sun's* reporters, R. A. Locke, describing marvelous discoveries said to have been made by Sir John Herschel at the Cape of Good Hope, filled two or three columns of the newspaper daily from August 25 to August 31, 1835. The famous astronomer, who had actually established an observatory at the Cape in 1834, was, according to this tale, employing a telescope of such extraordinary power that when it was turned on the moon the surface of that satellite was brought within an apparent distance of two hundred yards.

Flowers resembling poppies were seen growing over basaltic rocks, and the shifting of a screw brought into view green valleys, in which browsed animals resembling the bison, with here and there flocks of pelicans and cranes, and goats like those on earth except that they were one-horned. At length, as the lunar landscapes were made to move across the field of the telescope, some winged creatures, resembling human beings but having bat-like wings, were seen to alight upon a grassy plain. Sketches of alleged scenes on the moon accompanied this fantastic story, which was widely accepted as veracious until Locke himself admitted having made it out of whole cloth.

Edgar Allan Poe was the originator of an

almost equally successful hoax, which was likewise published in the New York *Sun* nine years later; in April, 1844. It described an imaginary journey across the Atlantic in a balloon and was printed as a news item. The crossing was said to have been accomplished in three days. Another fictitious transAtlantic journey by air was described in the aeronautical magazine, *Flying*, for August, 1918, less than a year before the first flight across the Atlantic was actually made. The story, which was published for the purpose of stimulating popular interest in aviation, told in detail of a flight by plane alleged to have been made from Harbor Grace, Newfoundland, to Dingle Bay, Ireland. It was illustrated and was accompanied by a chart of the supposed route.

The Glozel hoax, already mentioned, was one of many involving the pretended discovery of ancient or prehistoric objects; including one perpetrated more than two hundred years ago by students at the University of Wurzburg, Germany, on their professor, Johann Beringer. The professor was keenly interested in the then infant science of geology, and was overjoyed to discover, while excavating in a hillside near the university, a quantity of remarkable "fossils", all of which had been fabricated and placed there by his pupils.

Although these were fantastic in the extreme, including not only fake plant and animal remains, but some representing celestial objects and several inscribed in ancient languages, they deceived Beringer so completely that he published a learned treatise in Latin about them, profusely illustrated with pictures of the supposed fossils. When the students confessed the fraud, Beringer declared that their confession was merely a trick on the part of his enemies to ruin his scientific reputation, and continued to insist that the fossils were genuine. When he was finally convinced of the deception he tried in vain to buy up all the copies of the unlucky book, but he had become the laughing-stock of his scientific colleagues and he is said to have died of chagrin.

The most famous fake archaeological discovery in America was that of the so-called Cardiff Giant, which was dug up in October, 1869, near Cardiff, Onondaga County, N. Y.,

(Continued on page 174)

I'M GLAD I'M AN ARTIST

"When I see fellows in other lines being let out I'm glad I trained my liking for drawing and became an artist. A few years ago I was just like the rest. I had a job and nothing more.

"Now I'm a trained artist—and I've quit worrying. Every Tom, Dick and Harry can't fill my shoes. There aren't so many trained artists—and each of us has his individual style. Art training has certainly helped me to get up above the crowd. If you like to draw, take my advice and enroll now with the Federal Schools and train your talent."

Through the Federal Course you learn Illustrating, Cartooning, Designing, Lettering, Show Card Writing at home. More than fifty famous artists, masters of modern methods, contribute their experience to this course. For 15 years Federal Students have made good. Many Federal Students are now earning $2500 to $6000 a year — some even more.

Why be smothered in the crowd when Federal Training may help you to make a better place for yourself. If you like to draw, you may have art talent. Without obligating yourself in any way find out how the Federal Schools can help people with art ability. This may be your answer to the job problem.

Free Vocational Test

Fill in coupon below and mail for Free Vocational Art Test today. The way to make money is to train your talent. Find out about your ability.

. . . . . **Mail Coupon Now** . . . . . .

[redacted]

12061 Federal Schools Building
Minneapolis, Minnesota

Please send without cost or obligation to me Free Vocational Art Test, and your book, "A Road to Bigger Things."

Name .....

Address .....

City..... State.....

Age.... Occupation.. . . . .

Scientific Hoaxes Fooled the World

(Continued from page 173)

and was subsequently exhibited in several eastern cities, to the great profit of the exhibitors. It was a huge stone figure of human shape, alleged to be either a petrified man or an ancient monumental statue. Most scientists were skeptical about it and it was proved to be a fraud by Professor Marsh, of Yale University. This hoax was planned as a money-making scheme by one George Hull, of Binghamton, N. Y. The block of stone was quarried in Iowa, carved by a German mason in Chicago, stained and pitted to give it an appearance of great age, and buried at Cardiff a year before it was "discovered".

In 1894 an alleged mummified Indian giant, supposed to have been discovered by a party of prospectors in a cave near San Diego, Calif., was exhibited in various parts of the United States, but failed to achieve the financial success of the Cardiff Giant and ended its tour in a southern pawnshop. It eventually passed into the possession of Dr. F. A. Lucas, later director of the American Museum of Natural History, who found that it was composed mainly of gunny-sacking and scrap iron.

Another money-making fraud was the Keely Motor, which, according to its promoter, J. E. W. Keely, was destined to revolutionize the mechanical arts by providing unlimited power at a very cheap rate. It was said to operate by "etheric force" but after Keely's death in 1898 it was found to have been run by a concealed compressed air apparatus. The promoter of this scheme was backed by a large stock company, organized in 1874 to enable him to perfect the device, and he managed to deceive the stockholders for a quarter of a century.

A celebrated imposter of more recent times was Louis de Rougemont, who came into prominence in 1898. He claimed to have spent 30 years among the aborigines of Australia and he was hailed as a modern Robinson Crusoe. He lectured before the Royal Geographical Society in London, and nobody seems to have questioned his veracity until he made one fatal slip. He referred to flocks of "flying wombats". As the wombat always sticks to terra firma, questions began to be asked, and De Rougemont was unmasked as one of the cleverest fakers in history.

In the Journal of the New York Botanical Garden for September, 1919, J. H. Barnhart

published an exposé of numerous fake biographies, which had, in some unexplained way, crept into an otherwise accurate and authoritative work, Appleton's "Cyclopedia of American Biography". These sketches of purely fictitious botanists were accompanied by lists of their equally imaginary works, of which Barnhart quotes 69 titles.

Many years ago there flourished at Reading, Pa., a self-styled weather prophet of purely local renown named Elias Hartz. One day he entered the office of the Reading *Eagle*, and exhibited a "goosebone", as proof that the following winter would be a hard one. A member of the newspaper staff, Albert N. Burkholder, saw good "copy" in Hartz and his goosebone and proceeded to write him up. The initial article was followed by many more, published in New York and Philadelphia papers and reprinted all over the United States, setting forth the utterances put into the mouth of the rustic sage by his clever press agent.

Hartz, who would never have been heard of outside of his own neighborhood but for Burkholder, became a national celebrity. At the same time the superstitious notions about the goosebone, as a means of predicting weather, previously almost peculiar to the Pennsylvania Germans, became so familiar all over the United States that the word "goosebone" has become proverbial—though it has not yet found its way into the dictionaries.

Encouraged by the success of this enterprise, Burkholder later invented a numerous company of weather prophets, whose predictions were supposed to be based upon the rich weather folklore current among the Teutonic inhabitants of Reading and the surrounding Berks County. These worthies were alleged to hold annual "conventions" in the autumn, when the outlook for winter weather was discussed and a vote was taken on the question of whether the season was going to be mild or severe.

Burkholder's amusing reports of these mythical gatherings were published in leading American newspapers down to the year 1913, and were probably taken seriously by millions of people. They were finally discontinued at the request of the Weather Bureau.

Get Into... ELECTRICITY and... BIG PAY

Don't pound the pavements looking for a job! Don't take just any old job at small pay! Get out of the rut and into ELECTRICITY—the big-pay field where GOOD JOBS are always open for TRAINED men.

12 WEEKS TRAINING
On REAL Equipment

In 12 short weeks you'll step away from the untrained mob into a steady job with BIG PAY. Here at my big school, you receive actual, practical training in ELECTRICITY. Not with books, lessons or correspondence . . . but shoulder to shoulder with expert electrical instructors you work on full-sized moving, whirling motors; on generators, batteries, switchboards, telephone systems, radio receiving and transmitting sets, and everything electrical. You need no previous training. Every day I receive requests for McSweeny trained graduates. What's more, McSweeny graduates get the big-pay jobs because they are TRAINED for them.

Learn Electricity The McSweeny Way

SATISFACTION GUARANTEED! YOUR RAILROAD FARE PAID!

Come to my school. You'll learn electricity, including Radio, by DOING. No books to read. No tedious lectures. You stay with each step until you KNOW it. When you graduate, I guarantee that you'll know electricity. YOU are the sole judge of your fitness for a BIG JOB. Your tuition will be refunded if, upon graduation YOU are not satisfied. But ACT NOW.

FREE Big Illustrated Book Sent FREE

Take your first step to big pay TODAY. Mail the coupon for my big illustrated book on ELECTRICITY. Get my Free Railroad and New Low Tuition offers NOW.

McSweeny Electrical School
Dept. E-11-12 Cleveland, Ohio

J. H. McSweeny, Pres.,
McSweeny Electrical School,
Dept. E-11-12, Cleveland, Ohio.
Dear Mac. Without obligation, send me your big, interesting book on ELECTRICITY. Also Railroad Fare and Low Tuition Offers, and details of Employment Service.

Name

Address

Town State

Shop Blueprints

for building your own boats and airplanes

THE most popular "how to build" plans run in Modern Mechanics and Inventions are now offered to the home craftsman in blueprint form—large, clear blueprints with dimensions and construction details carefully shown. Blueprints will be mailed postpaid anywhere in the United States or Canada at the prices quoted.

Pietenpol Air Camper

A two-passenger parasol monoplane, powered with a Ford Model A motor. Blueprints show motor conversion details. A remarkable performer which can be built for less than $500 complete. Complete set of blueprints, $7.50.

Ramsey Flying Bathtub

A two passenger monoplane of unique design, extremely easy to fly, with a landing speed of around 20 miles an hour. Powered with Aeronca motor, or one of comparable horsepower. Designed as a safe plane for beginners. Complete set of blueprints, $7.50.

"Gannet"—A Ford-Powered Cruiser

This 24-foot boat is powered with a Model T. Ford engine. She'll develop up to 15 miles an hour (better than that, if you substitute a more powerful motor for the Ford) and you'll find her a sturdy craft which can be built at a minimum of expense. Blueprints, per set $2.00

"Wanderboat"

All that its name implies—a combination outboard runabout and cabin cruiser, light enough to tow on a two-wheel trailer behind your car. Ideal for vacation time cruising, and capable of 35 m.p.h. with a good outboard motor. Set of blueprints $2.00

"Punkin Seed"

A small outboard racer, extremely simple to build, developing a speed of around 40 m.p.h. with a standard outboard motor. Strictly a one-man boat—easily portable. Blueprints, per set . . . . . 75 cents.

MODERN MECHANICS AND INVENTIONS BLUEPRINT DEPT.
529 So. Seventh Street, Minneapolis, Minn.

Models That Helped Justice

(Continued from page 75)

sultation, Mr. Boucher agreed to make three models to be used in connection with the suit.

After several weeks of work, involving an inspection of the site of the subway, making drawings and sketches, as well as preparing materials to represent steel, wood and concrete in the models, Mr. Boucher and his assistants commenced the making of the models.

At the Boucher plant they made one model to illustrate how the completed subway looked. Another showed what the construction company was compelled to do with the beams, being a reproduction of the excavation with the timber supports. The third model pointed out the efficiency and economy they might have enjoyed had they been able to use the 50-foot steel girders.

The original trial lasted four weeks. Throughout the entire proceedings the members of the jury gathered around the models, each of which was 30 feet long, and they were keen observers of every detail and followed the arguments and explanations of the attorneys with much understanding.

"It was quite gratifying," said Mr. Grout, "to notice how effective the models were. You could not expect to get twelve men on a jury who were engineers and mechanics. All the talking in the world would not and could not bring home the points which we could clearly illustrate with these models before us. I consider the use of models a very important factor in litigation of this type."

The final award to the Litchfield Construction Company was $1,075,000, not only the biggest verdict on record in a case featuring the use of models, but in itself one of the biggest judgments a jury has ever handed down in the New York courts.

Attorneys for railroad companies make constant use of models, as do the lawyers for persons suing the carrier lines. A short time ago the Pennsylvania Railroad was ordered by a jury in the Hudson County Circuit Court, in Jersey City, to pay $242,100 for the deaths of four persons, as the result of a train crashing into an automobile at a grade crossing. Models were introduced to show the oncoming train, the automobile with the passengers advancing toward the tracks and the absence of any warning signal.

Models That Helped Justice

The so-called Hamburger case, tried in Supreme Court, New York City, is the most prominent of those involving suits against railroads, and at the same time it illustrates the advantageous use of models.

Meyer Hamburger, a New York business man, brought suit against the Florida East Coast Railway Company, of Jacksonville, Fla., seeking $150,000 for injuries sustained when he was injured in a train derailment on April 3, 1923. He was traveling from West Palm Beach to Jacksonville when, he charged:

"The track broke, shifted or gave way and said train became and was derailed, that the car of said train in which plaintiff was riding as a passenger was turned over. The defendants, its agents, servants and employes so carelessly and negligently constructed and inspected and maintained its railroad track at said place, that the track broke."

The law firm of Spaulding & McCabe, of New York, directed the John Kunst Model-Making Company to reproduce the scene of the accident according to testimony and facts they had gathered. Carl Stricker, expert modeler of that company, thereupon made a model bearing out the chief contention of the railroad.

The model showed an electrically driven train, with ten passenger cars, going along the tracks until it reached a switch. On passing this point, a brake-shoe dropped from the wheel, an unavoidable mishap and entirely fortuitous. The brake-shoe held the switch, causing the derailment.

So exact was the model in adherence to what actually happened that the jurymen were astounded as they saw the miniature train laid out before them on the table and saw the shoe drop just as it approached the switch, forcing the engine and the cars behind it to jump the track and turn over. The $150,000 claim for damages was denied.

Not long ago a man was being tried in a New York court on the charge of arson. Business had gone on the rocks, the state complained, and he had resorted to incendiarism to replenish his sinking bank account. In the complaint, firemen who responded to the alarm testified that they had seen him running from the store and that

(Continued on page 178)

fun!

see what an amateur made with

PLASTIC WOOD

Plastic Wood—which comes in 9 colors—not only seals cracks, hides nicks and repairs a thousand and one things...It is the finest preparation in the world for modeling everything from turtles and ships to picture frames. Fun working with it. Easy. Anyone can use it. Try it. Sold by all paint, hardware and department stores.

MAIL TODAY FOR 48-PAGE BOOK AND COLOR CHART—FREE!

The A. S. BOYLE CO., Dept. 12-MM, Cincinnati, Ohio
Send me—free—Big Book of Uses for Plastic Wood.

Name.....
Street & No.
City..... State ..

THIS OFFER GOOD IN UNITED STATES ONLY

A New . . .

LUBRICATING PROCESS!

PYROIL

DEFIES HEAT AND COLD. ENDS NOISE AND WEAR.
BIG PROFIT OPPORTUNITY FOR SALES-MEN—DISTRIBUTORS.

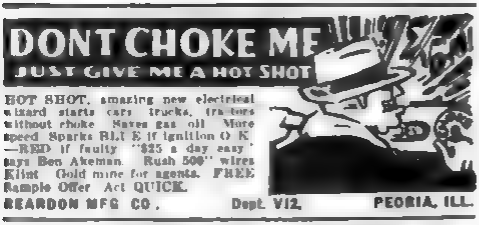
PYROIL makes cars perform almost unbelievable feats under grueling tests and terrific strain. PYROIL is a *concentrated super-lubricant.* Added to oil and gas, it *guarantees protection* against motor noise and wear, loss of power and depreciation. It seals rings, frees valves, removes carbon, greatly increases life of lubricating oil and attains increased mileage. *For Cars, Airplanes, Boats, Trucks, Tractors, Positively harmless—no chemicals—fully guaranteed.*

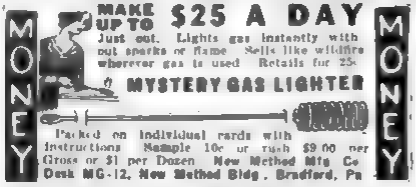
EARN UP TO $200 WEEKLY

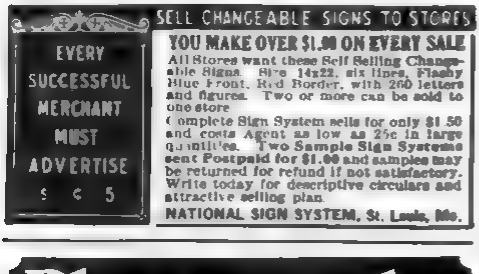
Nationally Advertised. Tremendous growing demand. Write at once for amazing facts, full details, Sales Plans and territory openings. DON'T DELAY.

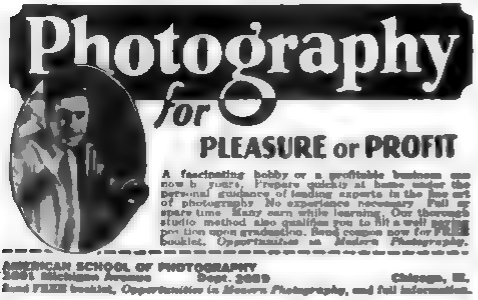
W. V. Kidder, Pres.
THE PYROIL COMPANY
6121 Pyroil Bldg., La Crosse, Wisc.

Nationwide Tested, Proven Used.









Models That Helped Justice

(Continued from page 177)

when they rushed into the conflagration the odor of kerosene almost knocked them over. To all outward appearances, the merchant was due for a stretch in Sing Sing.

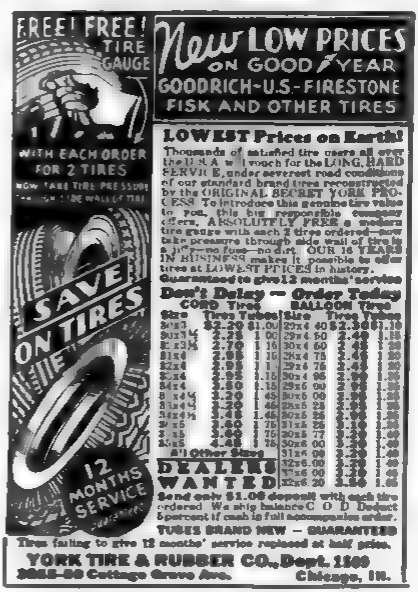
What the jury needed, in the mind of Samuel Leibowitz, prominent and versatile criminal lawyer, was a model. His client's fate was in the hands of a model, reasoned this veteran of scores of sensational trials.

During the final moments of the trial, Attorney Leibowitz motioned to one of his clerks to bring in the exhibits. They were ten colored, long-necked bottles, specially made, and labeled by letters.

One of the bottles, Attorney Leibowitz explained to the court, contained pure kerosene, and furnished the testimony of an expert to that effect. The other bottles contained other liquids, non-inflammable.

Those who had testified to smelling of kerosene on the scene of the fire took the stand all over again. The jury looked on with almost childish interest. Each one of the witnesses was given the test, under the eager glances of the jurymen.

When the results of the tests were announced, it was revealed that not one of the state's witnesses had recognized the smell of kerosene. The jury came back with an acquittal in three minutes.



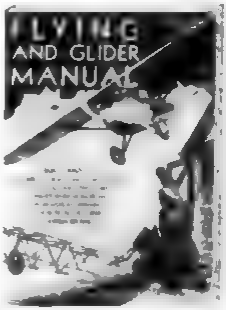
IT'S OUT - - The NEW 1932 EDITION of the Flying and Glider Manual

YOU'VE been waiting patiently for it for months—and here it is, bigger and better than ever—by long odds the most up-to-the-minute and practically valuable edition of the Flying and Glider Manual ever published. The Ford-powered Air Camper plane you see at the top of the page, which can be built for less than $500, is only one of many light planes which you can construct from plans appearing in the 1932 Manual—it's no wonder airplane enthusiasts throughout the country have called the Manual The Sportplane Authority of America.

Nowhere else will you find plans like these—authoritative, complete, lavishly illustrated with photographs and working drawings which make it easy to build your own airplane. Pick any one of the half dozen ships in the Manual and start to build it from the plans in the book—all you'll need will be tools, materials and a workshop; the Manual supplies everything you need in the way of plans and instructions. No use delaying—get your copy NOW!

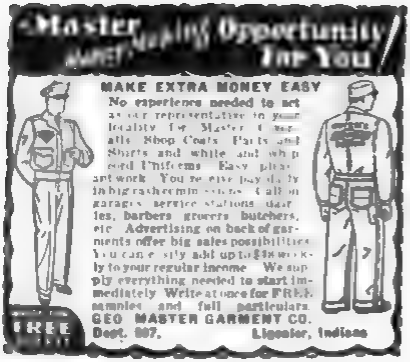
PARTIAL LIST OF CONTENTS

A Two-Place Ford-Powered Monoplane
Building the Ramsey Flying B[illegible]
Plans for the P-H Biplane Racer
How to Build the Heath Super-Soarer Gl[illegible]
Lessons in Glider Flying
Plans for a Penguin Practice Plane—motorcycle-engine ship for boys; does not take off the ground
Model Plane Tows Glider
Equipping Your Hangar Workshop
How to Build Good Wings
Streamlining Your Light [illegible]
And scores of others.



Price 50 Cents — On Sale at All News Stands

If your news dealer is sold out, send 50 cents to Fawcett Publications, Inc., 529 South Seventh Street, Minneapolis, Minn., and a copy of the NEW 1932 Flying and Glider Manual will be sent you at once

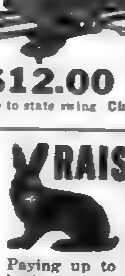


Turn Your Wood Lathe into a Metal Lathe

Sliding Tool Rest instantly attached to any type wood lathe with 6" to 13" swing. Ways are milled and gibbed for take up. 8" [illegible] longitudinal feed. Removable shield for turning large diameters at extreme left. Durable. Accurate. For home or commercial shop. Weight 20 lbs. Only $12. Sent on FREE examination. Write at once.

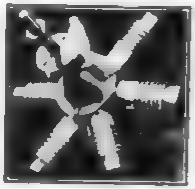
$12.00

Be sure to state swing. Clausing Mfg Co., Dept. 3121, Ottumwa, Iowa.



RAISE CHINCHILLA
AND NEW ZEALAND WHITE
FUR RABBITS
Make Big Money—We Supply Stock
AND CONTRACT FOR ALL YOU RAISE

Paying up to $6.50 each. Large illustrated book, catalog and contract, also copy of Fur Farming Magazine, all for 10 cents. STAHL'S OUTDOOR ENTERPRISE CO., Box 1208, Holmes Park, Mo.



MODEL-AEROPLANES, AIR MOTORS

This new 6-cyl. compressed air motor driving an 18" prop. 1700 r.p.m. develops 1/6 h.p. Flies 5' to 8' models. Newest rubber driven scale models, Helldivers, Boeing Pursuits, Travelairs, Lockheeds, New 6-ft. motor-driven Lockheed Vega. Send 10c for big new catalog

Miniature Aircraft Co., 83 Low Terrace, New Brighton, N. Y.

don't WORRY

ABOUT **RUPTURE**

Why put up with years of needless discomfort and worry? Try a Brooks Automatic Air Cushion. This marvelous appliance permits the opening to close, yet holds rupture securely, comfortably — day and night. Thousands report amazing results. Light, neat-fitting. No hard pads, metal girdle or parts to chafe or gouge. Patented in U. S. and 13 foreign countries. Try one 10 DAYS WITHOUT A PENNY'S RISK. You'll be delighted. Free book on Rupture and convincing facts mailed postpaid in plain sealed envelope. Address

BROOKS APPLIANCE CO., 146D State St., Marshall, Mich.

Science Hatches Oysters on Farms

(Continued from page 98)

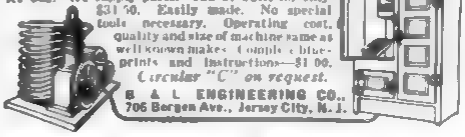
ous supply of pure-blooded oysters, instead of the mongrel type resulting from haphazard natural methods."

Science has discovered many interesting facts about the thickly-populated subaqueous cities in which oysters congregate. The murderers of those under-sea cities are the periwinkle which drills through the shells of the oyster and sucks out the meat, and the starfish which embraces his victim with his five strong arms, smothers it until it opens its shell, and then feasts, as the thousand-legged ogre turns its own stomach inside out.

American oystermen combat the destructive starfish by dragging large mops of rope yarn over the beds; the starfish become entangled in the threads and are drawn up and killed by plunging the mop into a vat of boiling hot water.

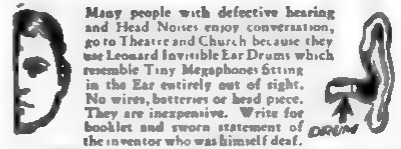
Oysters are served only during the months having the magic "R" in their name, an ancient adage having it that they are only fit to eat at this season, extending from September to April. During the summer, while the oysters are spawning, they are usually thin and poorly flavored, but in the fall and winter, they fatten and grow into prime food.

BUILD YOUR OWN AUTOMATIC ELECTRIC REFRIGERATOR



Why pay $200.00 and upwards? Use your present ice-box. We supply parts. Can be built for only $31.50. Easily made. No special tools necessary. Operating cost, quality and size of machine same as well known makes. Complete blueprints and instructions—$1.00.
Circular "C" on request.
B & L ENGINEERING CO.,
705 Bergen Ave., Jersey City, N. J.

DEAFNESS IS MISERY



Many people with defective hearing and Head Noises enjoy conversation, go to Theatre and Church because they use Leonard Invisible Ear Drums which resemble Tiny Megaphones fitting in the Ear entirely out of sight. No wires, batteries or head piece. They are inexpensive. Write for booklet and sworn statement of the inventor who was himself deaf.

A. O. LEONARD, Inc., Suite 811 70 5th Ave., New York

Print Your Own

Cards Stationery, Advertising, labels, paper, circulars, tags etc. Save money and time. Sold direct from factory only. Junior Press $6.00, Job Press $11. Power $149. Do popular raised printing like engraving with any of our presses. Print for Others, Big Profits. Pays for itself in a short time. Easy rules sent. Write for free catalog of outfits and all details. The Kelsey Co. H-9, Meriden, Conn.

Now! Do Your Own Electric Nickel Plating

COMPLETE INTRODUCTORY OUTFIT ONLY **$6.50**

Plate with Nickel, Brass, Copper, Silver, Gold, etc.

A REAL MONEY-MAKING OPPORTUNITY

NO EXPERIENCE REQUIRED Do YOUR OWN Electro Plating in Your Home, Garage, Office or Place of Business. Electrically Deposit Metal—Nickel, Brass, Copper, Silver or Gold. You can Successfully Do all the plating on your Automobile, Bicycles, Electric Sprays, Forks, Chandeliers, Toys, Coffee Urns, Surgical and Dental Instruments, Utensils, Large or Small Iron Stoves, Music Instruments, reconditioning or replating or plate New Work; do it instantly without interrupting the Service or without removing the parts to be plated with the

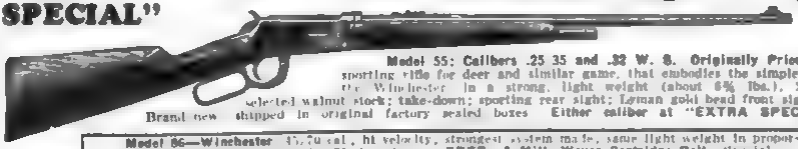
ALADDIN PORTABLE ELECTRO-PLATER

Simple and Economical to operate. Not a toy, but a practical Plating Outfit with which Perfect and Durable Work can be done. Positively Guaranteed to do as we claim. BE YOUR OWN BOSS. Build up a Profitable Aladdin Electro Plating Business of your Own. This offers wonderful ECONOMY to users and BIG MONEY MAKING possibilities to AGENTS. Thousands in Service since 1924. Write today for FREE PARTICULARS AND TESTIMONIALS.

P. J. F. BATENBURG CO. Dept. 229 RracINE, WISCONSIN

—AGENTS— WANTED EVERYWHERE

"EXTRA SPECIAL" Sale WINCHESTER Latest Light Weight T. D. $24.95



Model 55: Calibers .25 35 and .32 W. S. Originally Priced at $44.70. A new sporting rifle for deer and similar game, that embodies the simple dependable action of the Winchester in a strong, light weight (about 6½ lbs.), 24" tapering barrel; selected walnut stock; take-down; sporting rear sight; Lyman gold bead front sight; capacity 5 shots. Brand new, shipped in original factory sealed boxes. Either caliber at "EXTRA SPECIAL" price—$24.95.

Model 86—Winchester .45 Cal., hi velocity, strongest system made, same light weight in proportion as Model 55. Regular $48.75, brand new. FREE—A Mills Woven Cartridge Belt. Special. **$23.95**

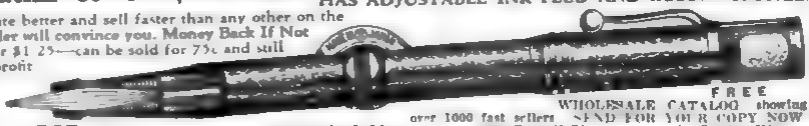
Write for NEW Illustrated Catalog "M". Shotguns, Rifles, Binoculars, etc.

HUDSON SPORTING GOODS CO. **M-52 Warren St., NEW YORK CITY**

AGENTS MAKE UP TO $15 A DAY.

NO. 8 FOUNTAIN PEN GUARANTEED FOR LIFE. HAS ADJUSTABLE INK FEED AND RUBBER SPONGE.

which makes it write better and sell faster than any other on the market. A trial order will convince you. Money Back If Not Pleased. Retails for $1.25—can be sold for 75c and still make over 100% profit.



SAMPLE ONLY **39c**

DOZ., $2.90

SPORS IMPT CO., 931 Fawcett St.

FREE WHOLESALE CATALOG showing over 1000 fast sellers. SEND FOR YOUR COPY NOW. Le Center, Minn.

Be A Detective

Make Secret Investigations

Earn Big Money. Work home or travel. Fascinating work. Experience unnecessary. **DETECTIVE** Particulars FREE, Write to **GEORGE M. F. WAGNER, 2190 Broadway, N.Y.**

Photos ENLARGED

Size 16x20 inches. Same price for full length or bust form groups, landscapes, pet animals, etc., enlargements of any part of group picture. Safe return of your own original photo guaranteed.

98c

SEND NO MONEY Just mail photo or snapshot (any size) and within a week you will receive your beautiful enlargement, size 16x20in. guaranteed fadeless. Pay postman 98c plus postage or send $1.00 with order and we pay postage. **SPECIAL FREE OFFER** With each enlargement we will send Free a hand tinted miniature reproduction of photo sent. Take advantage now of this amazing offer—send your photo today.

UNITED PORTRAIT COMPANY 900 W. Lake St., Dept. W-371, Chicago, Ill.

Amazing! Perfected! NEW HALF SOLES 9¢ a Pair

Pays Agents Up to $42 DAILY

Savasole—"Plastic Leather"—Spread it on soles in a minute with old knife. Dries hard and smooth over night. Write today for Free Sample. Rebuilds worn heels, rubbers, and over 1000 other articles.

SAMPLE FREE!

RUSH NAME AND ADDRESS for Free Sample and money-making records of men and women earning up to $42.00 daily. Everybody a prospect. Men, women, especially children. Without experience—in spare time you can enjoy profits like Miller of Ohio. He made $135 his first week. Now he orders in 1000 lots. Thousands are cleaning up with this amazing specialty. Act now—while it's NEW!

THE PERFECT MFG CO.
N-371 Daylight Bldg., Cincinnati, Ohio

(Avoid substitutes—only SAVASOLE has the Double Action Process)

BETTER GIFTS FOR CHRISTMAS!

A Gerstner Tool Chest

Is Ideal for Toolmakers and Machinists

Write for free catalog.

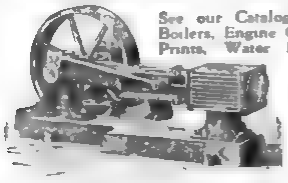
H. GERSTNER & SONS

796 Columbia St., Dayton, Ohio

Thread cutting lathe and Countershaft $55.00, use lever in gearbox to shift carriage while cutting threads. 12" Band Saw with tilting table $30.00 Send for Catalogue on these and other machines.

ROSSBACHER MACHINE CO.

1516B Forwood Ave., Toledo, Ohio



See our Catalog for Electric Motors, Boilers, Engine Castings, Practical Blue Prints, Water Motors, Lathes, Drill Presses, Fittings and Supplies for Models. Catalog 15A sent postpaid, 10c

Howard Engine & Mfg. Co.

2417 N Ashland Av. Chicago, Ill

CORRECT Your NOSE !

Anita Nose Adjuster shapes flesh and cartilage — quickly, safely, painlessly, while you sleep or work Lasting results Gold Medal Winner 87,000 users. Doctors praise it Write for FREE BOOKLET

ANITA INSTITUTE

N-75 Anita Bldg., Newark, N. J.

SOMETHING DIFFERENT

MYSTERY CIGAR LIGHTER

MAKE UP TO $40 A DAY

Showing this Scientific Marvel to Men. What Makes It Light? New Principle of Ignition All Guaranteed No Flint or Friction. Sample with Sales Plan, 25c. Sample Gold, Silver or Chromium Plated, $1.00. Agents write for proposition

New Method Mfg. Co., Box M-12, Bradford, Pa.

DANCE SKILL WITH PROFESSIONAL POISE!

Best Instruction Ever Offered. Easy as A-B-C. Latest Steps, Fancy Steps. Send $1.98 for complete course MONEY BACK after 5 days if not satisfied.

☐ TAP and CLOG ☐ BALLROOM — Mark X for the course desired.

DANCEOGRAPH DANCE ART, Inc.

555 Sutter St., San Francisco, California

New 1932 Flying Manual On Sale at All Newsstands

Profits From Air Rifle Gallery

(Continued from page 128)

means of a piece of sheet iron or strap iron bent to shape. From this depends a piece of bar brass which acts as the bell. A small hinge is riveted to the top end of the strap iron support, thus permitting the target to swing back and forth.

The stationary target (Target "B") is the same diameter as the swinging affair, save that its bulls-eye is ½ inch in diameter and it is attached to the back of the frame by means of two bolts which run through 2 by 2 inch pieces 3 inches long. From one hangs a bell taken from an old alarm clock.

Midway between the swinging and stationary round targets, is a spinner (Target "C"). This is made from a piece of light strap iron drilled ¼ inch one side of center. The ends are formed to a point, put through the centers of 2 by 2 inch squares of heavy sheet metal and riveted. A bolt runs through the center of the arm and through the ends of strap iron supports bolted to the back of the frame. Short pieces of rubber tubing are slipped over the bolt to prevent play of the spinner. One end being slightly heavier than the other, it always remains in an up and down position. Struck with a shot, it will spin around and around.

Directly below this is a regulation aluminum target (Target "D") frame to hold paper targets for individual scoring. This target is furnished by a large air rifle manufacturer for $.50. It enables patrons to read their scores.

Details are beginning to take shape nicely now. There remains the rabbits and the flat belt. To the three ply canvas are fastened the 8 rabbits, evenly spaced, each cut from very heavy galvanized sheet iron, of the shape shown. The hinges are of iron, about 1 inch long. Figs. 4 and 6 show how the rabbits are assembled. The hinges should be riveted to the front edge of the belt so that the rabbits will drop slightly forward when on the top side. A hinge is made so that it will swing through three quarters of a circle. Be sure to set them in place for riveting so that one hinge half will lock against the other half and thus hold the bunny upright when in position.

Finally, the frame including the back board, was painted black, and the targets, aluminum, the paint for the latter being rubbed on with a rag. A shooting distance of about 20 feet, if available, will be ideal.

Profits From Air Rifle Gallery

One improved air rifle, recently placed on the market, holds 25 shots. It is pumped up, but an adjustment at the breech can be made so that at least 20 shots can be fired as fast as you can pull the trigger. And, we admit, that is fast shooting.

The commercial angle, mentioned at the beginning of this yarn, has real possibilities, especially in these depressing times. The attractive thing is this. You pay 25 cents for 12 shots at a regulation shooting gallery where 22 caliber guns are used. Put on a profit basis, this air rifle gallery will make more money if you give 20 shots for a dime, or 50 shots for a quarter, than the gallery using .22 guns, when 12 shots for a quarter is charged. The steel pellets cost but a nickel, retail, for a box containing upwards of 175 and the operating cost is negligible.

Here's what one air rifle gallery operator did. He charged 10 cents for 20 shots, or 25 cents for 50. His daily receipts, in connection with his barber shop in the small town, were about $6. And, after 60,500 shots had been shot through the gun, he found that it was shooting as hard and accurately as when he got it. The gun he used cost $5.

Summing up, such a gallery will give the customer 4 times as many shots for a quarter as he can get where 22 caliber guns and ammunition are used—a big inducement. The targets just described offer a variety, coupled with action, which will draw the crowds. Incidentally, the gallery described in this story was loaned to a miniature golf course immediately after completion, and it has been earning good money.

BE A RAILWAY TRAFFIC INSPECTOR

RAILWAYS AND BUS—BIG OPPORTUNITY

ACTIVE MEN—19 to 55—needed in this profitable, steady profession. I. C. S. B. T. I. graduates are in demand. Travel or remain near home—meet high officials. On completion of a few weeks' home study, we place you in a position paying $120 to $150 per month plus expenses to start, or refund tuition. Many graduates have become important executives. Write for Free Booklet that shows how to make your future secure. Standard Business Training Inst., Div 6112, Buffalo, N. Y.

The EASY WAY to build

an up to date Model Gas Engine on your own lathe is with a set of

WALL CASTINGS and DRAWINGS

We supply everything

Send 10c coin for circular.

ELMER WALL

5000 N. Fairfield Ave., Chicago, Ill.

LEARN AUTO MECHANICS in 8 weeks!

Earn $50 to $100 a week as an Auto Expert. Never in the history of the automotive business has there been such a demand for TRAINED men. 8 weeks training fits you for a job that's waiting for you or to open your own repair shop. Read what two McSweeny trained men have done. Hundreds of others can tell you facts equally interesting. Don't look for a job! TRAIN for it!

George Smith owns an agency and repair shop in West Alexandria, Ohio. He makes $200 a week. You can do the same.

His McSweeny training put C. E. Gillespie in charge of State Highway Commission's truck and tractor fleet.

EIGHT WEEKS of Actual Shop Training

No books or lessons the McSweeny way. First you learn the "why" of everything you do; then under competent instructors, you DO the job. You work on real equipment and machines, with the real tools of the auto expert. In eight short weeks, you are TRAINED to hold down a permanent BIG PAY job. Any man 16 to 60 can learn. Write today for New Low Tuition Offer, including

AVIATION and AUTO ELECTRICITY

Aviation is the new field that is paying big money for specially trained men. The McSweeny course in Auto Mechanics includes Aviation Mechanics. You learn on real airplane engines under experienced instructors. The FREE special course in Auto Electricity is fully described in the Big Auto Book. (Mail the coupon today.)

MONEY BACK GUARANTEE! FREE RAILROAD FARE ! ! !

In eight weeks of intensive training; actual shop work with real tools on real equipment; you will be qualified to accept a Big Pay Job as an Auto Expert. If you are not satisfied about your qualifications, your tuition will be refunded.

FREE Write today for Big Free Book on AUTOS. Get the facts about jobs; about Free Railroad and Low Tuition Offers. Mailing the coupon does NOT obligate you. It obligates ME to tell YOU how you can train for Big Money in eight short weeks.

McSweeny Schools

AUTO, TRACTOR and AVIATION

Dept. A-11-12 Cleveland, Ohio

MAIL COUPON FOR FREE BOOK

McSweeny Auto, Tractor and Aviation School,
Dept. A-11-12, Cleveland, Ohio.

Without cost or obligation, send me your Big FREE book on Autos; also full information about your low Tuition offer including R. R. Fare and FREE New Aviation Course.

Name .....

Street .....

Town ..... State .....

For Men who have home workshops...

YOU'VE been looking for a book like HOW TO BUILD IT, the Home Craftsman's Manual—chuck full of remarkable plans for building things in your home shop — profusely illustrated with photographs, dimensioned working drawings, everything presented in picture form and accompanied by non-technical descriptions. Here's a sample of what you'll find: Plans for a 15-Foot Sailboat; Log Cabins; Lawrence Water Glider; Electric Auto; Ozone Generator; Marionette Show; Flash Steam Engine; Radio-Controlled Model Battleship; Canvas Canoe—and hundreds of others.

LOOK for This Cover: Now on Sale

Price 50 Cents on all News Stands

If your newsdealer is sold out, send 50 cents to Fawcett Publications, Inc., Minneapolis, Minn., and a copy of How to Build It will be sent you at once.

Fortune-Making Ideas

(Continued from page 79)

low ingenious enough to come forward with an idea that will prove itself indispensable to the countless millions of bearings that have to be lubricated in this manner.

Specifications: The ideal oil or grease cup is one that will, first of all, insure a uniform flow of the lubricant to the bearing. In the case of grease, the grease should be fed by some sort of means for applying *easy* pressure either through a spring or through a simple mechanical device receiving its motive power from the machine itself. In the case of oil, the oil should drop into the bearing at a uniform rate. In either case, the grease and oil cup should have adjustable feed. More than that, there should be a means of showing when the cups are empty without resorting to glass in the construction. The inventor would have to guard against an involved piece of mechanism costing more than a few cents.

Exploitation: The importance of a successful patent along these lines would justify a more or less complete patent coverage in all foreign countries, especially England, France and Germany. It should be noted, too, that such a device, owing to its widespread use, should be sold only with a cash down payment and royalty.

3. The Home Needs a Water Faucet

AS IN the case of our oil and grease cups, our much vaunted civilization has failed to provide us with a really respectable water faucet. Although patented inventions run well into the thousands, we are in need of a water faucet that will not depend upon washers and that will last for years on end without attention.

Specifications: The faucet must be absolutely leak proof under water pressures up to two hundred pounds per square inch. It should have no replaceable parts and wearing should be compensated for automatically. The faucet will have to be especially designed to accommodate large differences in temperature. The faucet should also always work smoothly and easily and require no unreasonable strength to either close or open it.

Exploitation: A great fortune is easily available to any inventor of such a device providing that he has fair business sense. The idea should by all means be patented

in all of the leading countries of the world and it should be sold strictly on a royalty basis, unless a sufficiently large sum can be collected for an outright sale.

4. Presser to Remove Shine

AS I stood in a tailor shop watching a tailor laboring to remove the shine from the seat of a pair of trousers, it occurred to me that here was a job for a clever inventor. What is needed is a machine that will remove the shine by cutting a new nap. The first thing that came to my mind was the possibility of using some sort of a mild abrasive directed against the fabric under air pressure. Either that or some sort of a roller arrangement under which the garment could be placed. At any rate such a machine would find use in every tailoring establishment in the country.

Specifications: Undue wear cannot be tolerated, for in such a case the cure would be worse than the disease. The process must be gentle enough to raise a new nap without cutting too deep into the threads. The process should be rapid, requiring but a few minutes, and the machine designed for the purpose should be rather inexpensive, selling for about twenty-five dollars at the most.

Exploitation: Patented in the United States and sold outright. Such a machine should be worth $35,000.

5. Universal Electric Connection

WHAT housewife has not cursed the electric connections made to flat-irons and vacuum cleaners? They are constantly wearing out and giving trouble, oftentimes producing short circuits and shocking fingers that come in contact with them.

I have always thought that the problem has been attacked from the wrong angle. We need a universal electric connection at the end of our vacuum cleaner handles and on the end of flat irons. This should take the form of a ball joint that will permit the vacuum cleaner or the iron to be suddenly turned at acute angles without damage to the cord.

Specifications: The first real problem, as I see it, will be that of guarding against short circuits. The joint should be flexible enough to bend at an acute angle of ninety degrees in any direction. Then there

(Continued on page 186)

PATENTS

Protect Your Ideas

Write for free information, HOW TO OBTAIN A PATENT and RECORD OF INVENTION—or send drawing or model of your invention for examination.

Promptness Assured with Best Results

MILLER & MILLER
REGISTERED PATENT ATTORNEYS
FORMER MEMBERS EXAMINING CORPS, U S PATENT OFFICE
1006 Woolworth Bldg., Dept. B., New York
674 EARLE BUILDING, WASHINGTON, D. C.

UNPATENTED IDEAS CAN BE SOLD

I tell you how and help you make the sale. Free particulars. (Copyrighted)
Write W. T. Greene
925 Barrister Bldg., Washington, D. C.

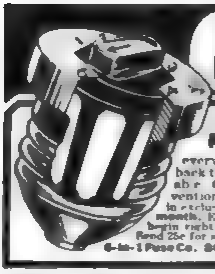
PATENT YOUR IDEAS REGISTER YOUR TRADE-MARK
Z. H. POLACHEK
1234 BROADWAY
NEW YORK
REG. PATENT ATTORNEY PROF. ENGINEER
WHAT IS YOUR INVENTION?
Send me a simple sketch of a model for
CONFIDENTIAL ADVICE — DO IT NOW!

PATENTS

BOOKLET FREE HIGHEST REFERENCES
PROMPTNESS ASSURED BEST RESULTS
Send drawing or model.
WATSON E. COLEMAN
724 9th St., N. W. Patent Lawyer Washington, D. C.

INVENTIONS WANTED

Patented or unpatented. If you have an idea for sale, write
HARTLEY'S INC., Box 928-B, BANGOR, MAINE



6 FUSES in ONE PLUG

Agents & Distributors Making Big Money A necessity everywhere. A "turn to the right brings back the light." Safe, economical, dependable 6-in-1 Fuse Plug. Most useful invention in years. Many of our distributors in exclusive territory making $500 to $1000 a month. Easy to demonstrate. Easy to Sell. Profits begin right away. Write at once for proposition. Send 25c for sample and working instructions.
6-in-1 Fuse Co. 861 W. Madison St., Dept. 211 Chicago

TRICKS WITH ELECTRICITY

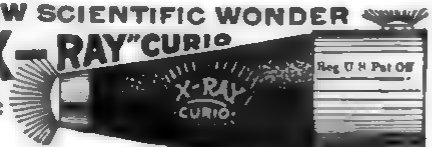
How to be a "human dynamo"—make electric lights obey voice—do spirit rapping and fortune telling by electricity—make all kinds electric novelties and devices at home. Electric Fun fascinating book telling how to do 200 stunts with ordinary house current (110 volts A.C.) $1.00 postpaid.
CUTTING & SONS, Dept. 101, Campbell, California

Don't Let $1.98 Stand Between You And A Good Head Of Hair

For years I suffered from dandruff and falling hair until a friend told me an old Canadian method. This treatment will stop falling hair, eradicate dandruff and grow new hair. My baldness has been replaced with luxuriant new hair. Dozens of my friends have had equal results. The method is simple, easy and positive. Send me $1.00 to cover costs and I will mail you this prescription and method of treatment with my positive guarantee that you will be satisfied or I will return your money. A few cents at any druggists buys the necessary ingredients. You will thank me many times as my friends have for telling this method which has succeeded where everything else has failed. $1.00 only, and your hair trouble is solved for the rest of your life.
STED PITT, Dept. I-O, 153 Court Street, New Haven, Conn.

NEW SCIENTIFIC WONDER

"X-RAY" CURIO



10c 3 for 25c

"Your Own"

BOYS BIG FUN. You apparently see thru Clothes, Wood, Stone, any object. See Bones in Flesh. FREE PIC radio picture films, takes pictures without camera. "You'll like 'em." 1 pkg. with each 25c order.
MARVEL MFG. CO. Dept. 88. NEW HAVEN, CONN.

EARN MONEY

Casting Metal Toys and Novelties

We have a good opening for several ambitious men to manufacture Toy Soldiers, Animals, 5 & 10c Store Novelties, Ashtrays, etc., needed to meet big demand. High import duty and present conditions in Germany offer chance for an enormous business here. We furnish casting forms for product, and cooperate in selling goods you make, also buy them from you. No experience or steel plant necessary. A chance of a lifetime for man with small capital. CHARTER-MAN BUSH is now starting. So if you mean strictly business and want to handle wholesale orders now being placed, write AT ONCE for full information.

METAL CAST PRODUCTS COMPANY
Dept. 2, 1696 Boston Road, New York City

1932 FLYING AND GLIDER MANUAL NOW ON SALE.

Fortune-Making Ideas

(Continued from page 185)

is the problem of insuring absolutely firm electrical contact at all times to prevent heating and burning due to sparking. The device, too, should not be so involved that it cannot be manufactured to sell under a dollar. All considered, it is a most fascinating problem and one well worth the attention of the inventor who is out after rich rewards.

Exploitation: The inventor of a successful electric joint should not sell his idea outright but rather license it for use to the various manufacturers of such devices. He should also license it to a manufacturer of electrical accessories who could make it to sell for use in connection with the thousands of electrical devices already in use. The idea should be patented in the principal countries of the world.

6. Something for Chemical Inventors

NEED for a more highly perfected chemistry of ink is still with us. What we need is an ink that will dry practically as fast as it is laid on paper and one that will not fade. Of course, it will have to be so formulated that it will not corrode pen points and it should have no offensive odor. To prepare himself for adventures in this line of chemistry, the inventor should read literature on colloidal chemistry. I can recommend no better book on the subject than Wilder Bancroft's, which may be obtained in any large public library.

Specifications: Instantaneous drying, nonfading and low cost of production are the essential requirements of such a product.

Exploitation: The resulting formula should be patented in all the principal countries of the world and a royalty should be insisted upon—a small amount upon each gallon produced. The rights to manufacture should be given to the larger concerns of each country.

7. Alignment for Typewriter Keys

AS I sit here pounding out this copy for MODERN MECHANICS I am thinking how many improvements might be made on a typewriter. Perhaps one of the most needed inventions is a method of keeping the keys in absolutely perfect alignment so that when they strike the paper they will always be perfectly placed.

Fortune-Making Ideas

In considering the problem, I have often thought that perhaps the levers upon the end of which the letters are mounted are too long. A very short lever would not have the tendency to bend that the longer levers have. I do not mention this as a solution to the problem but rather as a possible method of approach.

Specifications: Such a device or change in the design of a typewriter should add little or nothing to the cost of manufacture. Not only that, but the method should be perfect enough to keep the keys in perfect alignment during the entire life of the machine.

Exploitation: Patented only in the United States and sold outright to some large producers of writing machines would appear to be the best plan to follow. Such an idea ought to be worth at least $50,000.

BOYS—It Flies!

READY to fly. Not a construction set. Aluminum propeller Sturdy. Flies straightaway, loops Immelmans as you wish Every one a guaranteed flyer. To introduce our Hawk army models, we are making this startling offer. Enclose 10c, coin or stamps. We will send your plane, postpaid. Money back if not satisfied

Only **10c**

Warner Co., Dept. A-2, 160 E. Illinois St., Chicago

Chromium Plating Powder

PLATES IRON, STEEL, NICKEL, BRASS and COPPER without electricity or machinery. Guaranteed not to tarnish; dispenses with polishing. Half pint can $1.50, prepaid. Particulars FREE. GUNMETAL CO., Ave. S, Decatur, Ill.

NERVES?

Are You Always Excited? Fatigued? Worried? Gloomy? Pessimistic? Constipation Indigestion cold sweats, dizzy spells and nervousness are caused by NERVE EXHAUSTION. Drugs, Liquors and medicines cannot help much, and never. Learn how to regain Vigor, Calmness and Self Confidence. Send 25c for this amazing book

RICHARD BLACKSTONE, N 3312 Flatiron Bldg., N.Y. C.

Elite Diamond

SEND IT BACK!

$3.89 C.O.D.

1 Carat Elite Diamonds. Matchless ... rainbow brilliancy. You ... a bright Elite Rings surpass ... Stand acid and other tests. Handsomely engraved Ring, sterling Guaranteed. Looks like $250.00 Proud owner offered $85.00 6 minutes after buying one. With each ring order, we give free beautiful combination Set Set with small Elite Diamonds. SEND NO MONEY. Just send name, address and finger size. On arrival pay postman $3.89 and postage. Satisfaction Guaranteed Write today. Cash with Canadian or foreign orders

Collar and Cuff Links Given

ELITE JEWELRY HOUSE 75 East Wacker Drive Dept. 712, CHICAGO, ILLINOIS

DIAMONDS-WATCHES CASH OR CREDIT

10 MONTHS TO PAY

How to Order

Send first payment—state article desired—name of employer—kind of work you do—how long in position—age—married—where live—how long there EVERYTHING IS CONFIDENTIAL. Send first payment, OR goods sent for your FREE Examination on request.

No. 27 No. 936

No. 939 No. 963

No. 27—Dazzling blue white Diamond set in solid 18-k white gold ring, beautifully carved and engraved. $68.50 $1.75 a Week

No. 936—Fine blue white Diamond in man's ring of solid 18-k white gold, highly polished $37.50 $1.00 a Week

No. 963—Blue white Diamond in center of square top, 3 smaller blue white Diamonds on each side Solid 18-k white gold ring $150 $3.75 a Week

No. 939—Blue white Diamond, solid 18-k white gold ring with square top $25 $1.00 a Week

No. 950—Smart looking wrist watch, 15 Jewels solid 14-k white gold, with Kreisler mesh bracelet $225.50 $2.25 Down $2.25 a Month

No. 911—Man's strap watch, handsomely engraved, radium dial, 15-jewel Bulova movement Mesh band $37.50 $1.00 a Month

CREDIT TERMS: 1/10th down, balance weekly, semi-monthly or monthly at your convenience

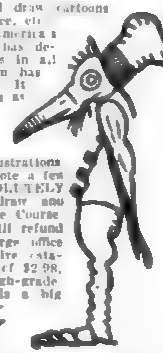
Send for FREE Catalog. 2000 Illustrations

LOFTIS BROS. & CO. Inc.

THE OLD RELIABLE ORIGINAL CREDIT JEWELERS Dept. G-285 30 North State St., Chicago, Ill. *Stores in Leading Cities*

34 Lesson Drawing Course $2.98

The biggest value you ever saw advertised anywhere



Haven't you often wished that you could draw cartoons illustrate some idea, sketch some pretty face, etc You can do all of these things One of America's most famous cartoonists and illustrators has developed a great simple system for success in all branches of Commercial Art This system has revolutionized the entire theory of drawing It means that drawing can be as easy for you as writing—much simpler than learning shorthand bookkeeping or typewriting We are now placing this original system for learning Drawing, Art and Cartooning consisting of 34 lessons with over 500 illustrations within reach of every one. If you will devote a few hours each week to the Course WE ABSOLUTELY GUARANTEE that you will learn to draw and draw well before you have half finished the Course If we fail to make this claim good, we will refund every cent paid us By eliminating a large office force for answering correspondence expensive catalogs etc we are enabled to make a price of $2.98, the cheapest price ever known for a high-grade home study course. Learn to draw. It is a big asset no matter what field you are in

SEND NO MONEY

Just order the course and on arrival pay postman $2.98 plus a few cents postage, payment in full for the entire Course and Drawing Outfit. If not entirely satisfied return within five days and we will Refund Money Address

LEDERER SCHOOL of DRAWING, Dept. 1986-Y Chattanooga, Tenn.

Orders from outside the U. S. A. are payable $3.28 cash with order.

If you order the Course at once, we will include a drawing outfit, consisting of artists' pencils, pens, paper, erasers, thumb tacks, etc., enabling you to go to work without any additional cost

Untold Chapters from

GLORIA SWANSON'S PAST

Now you can read, for the first time, new and intriguing chapters from the colorful past of Gloria Swanson, the fascinating woman of the screen who has been married and divorced three times and who has twice fought her way to film fame. This thrilling story is told by Adela Rogers St. Johns, Hollywood's foremost writer.

Other features in the December SCREEN PLAY: An actor tells on Greta Garbo, Ramon Novarro reveals his happiness secret, the stars give the recipes for their favorite Christmas dishes, and life on Malibu Beach is described. There are many other interesting articles. Do not fail to read—

December

SCREEN PLAY

Now on Sale Everywhere

If your news dealer is sold out, send 25c in stamps or coin to SCREEN PLAY Magazine, Fawcett Publications, Inc., 529 South Seventh St., Minneapolis, Minn., and a copy of the December issue will be mailed directly to you

Causes of Floods of Mud

(Continued from page 110)

cover areas extending as far as twenty miles from the mouth of the canyon.

Cloudbursts in the mountains near Sylvan Pass, Wyoming, during the night of July 22, 1923, caused a serious avalanche of this nature, blocking the east entrance to Yellowstone National Park for two days. Cloudbursts in the White Mountains of New Hampshire during the night of August 28, 1926, caused a large number of avalanches of mud. In this case thirty scars, some of which covered more than a hundred acres, were counted on the side of a single mountain.

Although floods of mud are comparatively rare as regards a particular mountain canyon they are comparatively frequent as regards the country as a whole. Hardly a week passes during the summer months when the newspapers in some part of the United States fail to tell about a flood of mud blocking a country highway, filling a city street, covering a mountain cabin, destroying a mountain ranch, or killing some unfortunate people who were caught unawares and were unable to escape.

Floods of mud of both canyon and avalanche type occur in all the western states. Canyon floods of mud of unusual severity which have occurred in western United States, in addition to those of August 13, 1923, at Willard and Farmington, Utah, include those of August 2 and 11, 1930, at Salt Lake City and Bingham, Utah; the flood at San Emigdio Ranch, California, in the summer of 1908; the flood in the Gunnison River Valley near River Portal, Colorado, in July, 1925; the Sand Canyon flood in the Sierra Nevada Mountains near Mojave Desert, California, in 1922; and the San Juan Canyon flood of August 26, 1915, in southeastern Utah.

Cloudbursts which cause destructive floods of mud are simply unusually intense thunderstorms. In the plains areas and rolling topography of central United States they are usually caused by the meeting of two thunderstorms moving in different directions, the resulting combination storm standing still and dropping its heavy load of moisture in one place. In mountainous regions cloudbursts may be caused by an upward movement of warm, moist air at the face of a mountain, condensation of moisture taking place as soon as the air reaches

Causes of Floods of Mud

the relatively cold atmosphere at the higher elevations. Cloudbursts in mountainous regions may also be caused by the movement of a thunderstorm toward a mountain range. When the storm reaches the mountains its progress becomes impeded so that it is forced to stop and drop its load of moisture at one location, resulting in avalanche floods of mud on the mountain slopes, or in the passage of a flood of mud down the mountain canyon.

Floods of mud are primarily responsible for the formation of the irregular, vertical-walled arroyos so often seen in the arid southwest. In fact the erosion of the large quantities of soil which make up floods of mud in arid regions is primarily responsible for the production of the unusual and fantastic topography, covering relatively large areas, which is found in many of the western states. Outstanding examples of such topography which might be mentioned are the Bad Lands of Nebraska and South Dakota.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912.

OF MODERN MECHANICS AND INVENTIONS, published monthly at Minneapolis, Minnesota, for October 1, 1931.

State of Minnesota } ss.
County of Hennepin }

Before me, a Notary Public in and for the State and County aforesaid, personally appeared Roscoe Fawcett, who, having been duly sworn according to law, deposes and says that he is the Editor of the MODERN MECHANICS AND INVENTIONS and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher, W. H. Fawcett, Minneapolis, Minn.
Editor, Roscoe Fawcett, Minneapolis, Minn.
Managing Editor, None, Minneapolis, Minn.
Business Manager, None, Minneapolis, Minn.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.)

Fawcett Publications, Inc., Minneapolis, Minn.
W. H. Fawcett, Minneapolis, Minn.
Roscoe Fawcett, Minneapolis, Minn.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.)

None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

ROSCOE FAWCETT,
Editor.

Sworn to and subscribed before me this 21st day of September, 1931.
[SEAL] PERN H. NEWALL,
Notary Public, Hennepin County, Minn.
(My commission expires Jan. 12, 1937.)

MAKE $500.00 A MONTH AND MORE EASILY THIS FALL AND WINTER

Hotter than Coal
~ and no dirt

A New Invention

Do away *forever* with the drudgery of wood or coal. The most simple and economical invention on the market is now giving perfect satisfaction to enthusiastic users everywhere.

Burns 96% Air—4% Cheap Oil

The International Oil Burner fits in the fire box of your furnace or stove. Installed in a few minutes. No noisy motors or complicated parts.

Costs only a Few Dollars

Heats any stove or furnace just as well as a $400 or $500 oil burner without electricity or gas. Simply turn one valve and have all the heat you want. Cleaner and better for heating and cooking. Approved by engineers everywhere. Over 100,000 in use.

30 Days FREE Trial Offer

Try this wonderful International Oil Burner right in your own home at our risk. Act quickly and get our special low introductory price. Sold under absolute money-back guarantee. Write at once for our free booklet on home heating and free burner offer.

"Listen in on our Weekly Radio Programs"

AGENTS—Our men are making big money introducing International Oil Burners. The demand is enormous. We want spare or full time workers immediately. If $500 a month and more interests you, write or wire us for our protected territory offer.

Clip This Coupon - - - - - - - - - - - - - - - - - -

INTERNATIONAL HEATING CO.
3806 Park Ave., St. Louis, Mo., Dept. 400-D

Send your free booklet and free details on home heating for stove ☐ furnace ☐. Also free burner offer.

Name .....

Address .....

☐ Check if interested in making money as an International representative with protected territory.

LOOK -- FELLOWS -- LOOK

Model Aviator--Featherweight Motor

For Use on Model Planes and Model Boats

New rock bottom prices. All parts bent, formed, turned and drilled. Knock down 3-cyl Kit, postpaid.

Air Tank Kit, 3"x3"x30" or smaller, postpaid, $1.95.

Tank complete, ready to use 3"x24" or 30" long, postpaid, $4.75.

NOW ONLY 99 CENTS

MODEL PLANE PLANS 10c

Stinson Monoplane, Travelair Mystery "S", S.E. 5 Pursuit, Lockheed Vega, Rocket Plane, Fokker Amphibian, Ott Hydro Model A-21" Seaplane.

3 Plans for 25c

Boeing P12-B American, D.H. Tiger Moth English, Ansaldo Italian, Gloster - 325 m.p.h. Seaplane Racer.

WATCH FOR 4 NEW PLANS EVERY MONTH
CATALOGUE 10c

DEALERS: Write For Discount on Plans
Model Aviator Products, Dept. 39, 3335 Eastwood Ave., Chicago

Play the Hawaiian Guitar like the Hawaiians!

Only 4 Motions used in playing this fascinating instrument. Our native Hawaiian instructors teach you to master them quickly. Pictures show how. Everything explained clearly.

Play in Half Hour
After you get the four easy motions you play harmonious chords with very little practice. No previous musical knowledge needed

Easy Lessons
Even if you don't know one note from another, the 52 printed lessons and clear pictures make it easy to learn quickly. Play as you study

GIVEN —*when you enroll* **a sweet toned HAWAIIAN GUITAR, Carrying Case and Playing Outfit—Value $18 to $30**

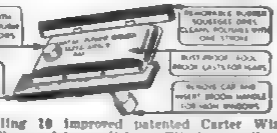
WRITE AT ONCE for attractive offer and easy terms. You have everything to gain. A postcard will do. ACT!

No extras everything included

TENOR BANJO and other courses. The same thorough instruction on Tenor Banjo, Ukulele, Tiple, Tenor Guitar, Ukulele, Banjo Ukulele. Well-known instructors. Write for full information.

FIRST HAWAIIAN CONSERVATORY of MUSIC, Inc.
9th Floor, Woolworth Bldg. Dept. 646. New York, N. Y.
Approved as a Correspondence School Under the Laws of the State of New York
Member National Home Study Council

AGENTS! SELLS LIKE WILDFIRE



$300 monthly selling 10 improved patented Carter Window Washers daily. Cleans, dries, polishes. Eliminates all muss. Good Housekeeping approval. Restricted territory. Write today. **Carter Products Corp., 977 Front Ave., Cleveland, Ohio.**

OUTDOOR JOBS

Wanted—Names of men desiring steady outdoor government jobs; $1,700-$2,400 year; vacation. Patrol parks; protect game. Write immediately.

DELMAR INST., Dept. A-32, DENVER, COLO

PANTS MATCHED

Don't Throw Away That Coat and Vest!

Save $15 or more! Let us match your coat and vest with new trousers tailored to your measure. Save the price of a new suit. Over 100 000 patterns. Mail sample of suit, or your vest which will be returned with FREE Sample for your approval.

FREE SAMPLE

Match Pants Co. 20 W. JACKSON BLVD. Dept. E14 CHICAGO

QUIT TOBACCO

No man or woman can escape the harmful effects of tobacco. Don't try to banish unaided the hold it has upon you. Join the thousands of inveterate tobacco users that have found it easy to quit with the aid of the Keeley Treatment

KEELEY

Treatment For *Tobacco Habit* Successful For Over 50 Years

Quickly banishes all craving for tobacco. Write today for Free Book telling how to quickly Free yourself from the tobacco habit and our Money Back Guarantee

KEELEY INSTITUTE, Dept. D-737, Dwight, Illinois.
Home of the famous Keeley Treatment for Liquor and Drugs. Booklet sent on request. Correspondence strictly confidential.

Fun With Crazy Music

(Continued from page 143)

of violin tones with a little experience.

Well, now let's see. Yes, there's that old fashioned horn type loud speaker. Not much use when static is bad but here's the way to make use of it at short notice. When nobody is looking remove the horn from the unit. Get a bugle mouthpiece and insert it in the neck of the horn. Then surprise the gang some night by madly yanking the horn off its base and blowing sweet bugle calls into the evening air. It's got a range like a fog horn and if you play taps will make the dead sit up straight.

Pop bottles were originally made to throw at baseball umpires but a pop bottle organ sounds a bit more peaceable. And umpires are off the job in the winter anyway. So, get a flock of bottles and tie stout strings around their necks as shown.

Make a wooden frame that will stand about 4 feet off the floor. No particular form of construction; just let your conscience be your guide. Drill holes in the top horizontal piece about 6 inches apart and hang a bottle from each hole by the string. Now fill them with water just the same as you did the goblets and tune them to the piano. Loudest tones are produced by hitting the bottle a light crack with a mallet composed of a small, soft but solid rubber ball impaled on a rattan stick. Pretty good stuff when played carefully.

Well, Feven's sake if here isn't the old tire pump joining the gang! Just an ordinary push and pull pump. Music? Sure, just put it up on that chair and hold it down with one foot. Then grab the end of the hose with one hand and pump with the other. Hold the forefinger of the nozzle hand over the outlet and press hard while pumping. Then by releasing just a small bit of air at varying pressures under the finger, tunes *can* be played on the old air pusher even so you'll recognize 'em. No foolin'!

We aren't through with the car yet because even that old bulb horn that used to make pedestrians hop around can be converted into a trombone that will make Arthur Pryor envious. Unscrew the rubber bulb and solder a piece of brass pipe a couple of feet long onto the horn. Then solder a second piece of pipe onto the bulb connection small enough to just slide into the first with a bit of lubrication.

Fun With Crazy Music

There you have a nice little slip-horn that can't be beat—no sir! Every punch of the bulb will emit a snort while the length of the air column varied by slipping the pipe in and out will change the pitch. Not very beautiful, but effective.

And as a last item for the kid brother to play comes the tin can whistle. Cut out the top of a tin can in a 3-inch circle. Then bend it double over the diameter so the two halves are parallel and stand about ⅛ inch apart. Drill a small hole down through both halves as shown and there you are.

But; how does one play it? Well, first you need a big mouth. Not so bad, you say? Put the whistle in the mouth with the open edges out and press the lips on the top and bottom sides outside the holes. Then rest the tongue against the edge of the tin just about even with the holes and blow. Sounds easy, eh? Well, it is, but if at first you don't get a sound try again, and in a short time you'll get the hang of it and be able to whistle any tune in the calendar with variations.

So, boys, get out the tools and the old cast-offs about the shop and let's hear some of your crazy music. Great fun for these long winter evenings but wait until the cop gets around to the other end of his beat before starting in. It'll be lots safer.

WELDING ELECTRICITY RADIO AUTOMOBILES

No Finer Training Equipment Anywhere at Any Price. Big Line Sheet Steel Structural Steel, Cast Iron, Air-Craft and Commercial Welding; Armature Winding; Power Plants; Switchboards, Transformers; Motors; Generators, Batteries; Radio; Television and Automobiles

LEARN BIG-PAY TRADES AT LOW COST.

Write for Information, Mentioning Course Desired

Coleman Electrical School, 1672 Main St., Kansas City, Mo.

MAKE YOUR VIOLIN

I HELP YOU!

Complete Instructions, Patterns, Woods, Parts.

I ALSO REPAIR

If Your Violin Needs Fixing Get My Prices

C. C. FRASER, Box 14M, Sta. C, Grand Rapids, Mich.

$12½ **80 SALES A WEEK**

STEADY PROFITS WEEK AFTER WEEK

That's the way Doublewear salesmen make money. A complete line—all dress and sport shoes. Prices low all the time. We pay all postage. Some good protected territories still open. Write for proposition. Doublewear Shoe Co., 101 E. Lake St., Minneapolis, Minn.

$2.95

No 0902

QUALITY Sheath Knife FREE

BOYS—Here's a pocket sheath knife. Has 3½ inch blade of finest carbon steel. Shaped for cleaning fish, skinning game. Special composition handle. Sheath of heavy genuine leather stoutly sewn. Just the thing for the angler, gunner, woodsman, for YOU. A quality knife. Satisfaction guaranteed. You can have it free.

A GREAT MAGAZINE

The Open Road for Boys has 96 pages a month crammed with the kind of breathless, blood-stirring stories you like—smashing tales of sport, high adventure, mystery, daring. Full of good dope on hunting, hiking and camping. The one magazine that will hold you spellbound—the one magazine you can't afford without.

all for $1

Regular subscription price is Open Road for Boys, $1 a year. Special offer: We will send you the Open Road for Boys for one year and give you free this sturdy, quality knife (with sheath) free. Limited offer. Rush your order today to

Deer Slayer
OPEN ROAD FOR BOYS
130 Newbury St., Boston, Mass.

Canada postage 25c extra. Foreign, 50c extra.

DRAFTING

BOOKS SENT FREE!
ON APPROVAL

For Beginners

Written, so you can understand every word, by 22 famous engineers and architects. DeLuxe flexible binding, nearly 2,000 pages, 1546 blueprints, charts and diagrams; prepares you for a good drafting job in mechanical or architectural lines. Sent for 10 days' free use if you mail coupon immediately.

5 Volumes New 1931 Edition

Only 15 minutes a day with these WONDER BOOKS will prepare you for a good drafting job in less than a year. Mechanical and architectural drafting from simple straight lines to important complex plans. *A step at a time.* Built especially for beginners, for men with only grammar school training, for drafting room practice. PLUS DYNAMETRIC. Made easy and clear. **Includes complete course in blue-print reading.**

Big Field Big Demand Big Pay

Capable draftsmen are steadily needed right now in all lines of engineering and drafting lines at $50.00 to $100.00 a week. Thousands of the best jobs FOR DRAFTSMEN MAKE THE BEST CHANCES FOR ADVANCEMENT. Pleasant, fascinating work, easy to learn and do. Learn quickly with these books—send coupon for 5 set FREE and see for yourself.

"I was a carpenter making $4 a day. I took up drafting and now I make $50 a week. I owe all my success to my training." This and many other letters of praise from men who have studied drafting will be sent to all readers of this famous standard of training. If my book is not worth more than the cost of the book.

FREE

Complete set of drawing instruments if you send for these drafting books NOW. These instruments are made of the finest of German silver, are absolutely accurate and are packed in velvet lined leatherette pocket case. A $10 value, but, now to you with these books.

AMERICAN TECHNICAL SOCIETY
Dept D-9320 Drexel at 58th St. Chicago, Ill.

American Technical Society, Dept D-9320 Drexel at 58th St., Chicago, Ill.

Send for 10 days' free use New 5 volume set of drafting. I will pay the few cents delivery charges. If I wish I may return books in 10 days and owe you nothing but if I decide to keep them I will send $2.00 after 10 days, then only $2.00 a month until $19.80, the special introductory price is paid. Send 1931 edition and include drawing instruments.

Name .....

Address .....

Employer .....

Employer's Address .....

A Book that puts you right behind the line of scrimmage!

YOU'VE always envied football sports writers their expert knowledge of the game—now you can understand the thrilling plays of the game as well as they, with the aid of "How to Watch Football." This book, written so you can understand it by Sol Metzger, famous football star and writer, will increase your enjoyment of the game a hundredfold. You'll be amazed at your ability to analyze the play of different teams—to predict what play is coming next—to pick the clever team and the brainy players.

Here are a few chapter titles which give you an idea of the wealth of fascinating information Sol Metzger has crammed into the pages of this great book:

How to Watch the Game—Understanding the Plays—Spotting the Clever Team—Watching for Weak Points—Doping the Next Play—Two Main Systems of Attack and Defense—Tricks of Coaches—Favorite Formations—Tricks of Lateral Pass—How to Spot the Decoys—Plays to Expect in Four Different Zones—Punts and Passes—Modern Methods—Secret Practice.

Fully illustrated with photographs and diagrams.

Price 50 Cents

Now on Sale at All News Stands

If your news dealer is sold out, send 50 cents to Fawcett Publications, Inc., Minneapolis, Minn., and a copy of "How to Watch Football" will be mailed you at once.

Gridiron Strategy Made Simple

(Continued from page 53)

their team may slip into unguarded areas down field.

On the other hand, if the ends do not go down the field at the snap of the ball, then watch the running play or the lateral pass that is usually worked in with it. You won't miss many tricks in football if you follow a game in this way.

In watching a game, note the defense. Some teams play seven men on the line all the time, with one man, the fullback, backing up the line, and with two halfbacks eight or ten yards back, and then the safety man far back to handle quick kicks.

Others play their seven men on the line with a box formation in the backfield, two of the backs backing up the line and the other two playing back at various distances from ten to twenty yards, depending on what they think the opponent is going to do on the ensuing down.

A third formation that is jumped into quickly from either one of the two just described is for the center to drop back of the line a few yards on one side, with a back backing it up on the other side. The three other backs remain about ten or twelve yards back of the line.

Such a defensive formation is common when a forward pass is expected; that is, when a team has five or more yards to gain to secure a first down on its third or fourth rush.

The best way to stop such an attack is to deploy at least five men behind the line to break it up. The three backs at the rear rarely advance at such a time unless a running play gets well under way. They lay back to stop passes and to be on hand should a trick be pulled off.

The nearer a team is forced to its goal-line, the stronger its defense becomes. Thus the scoring zone, the last 25 yards, is the most difficult one in which to gain ground. This is due to the fact that there is a limited area here in which an opponent may throw forward passes. Then a defense plays seven men on its line of scrimmage and uses a box back defense that places two of the backs just back of the line in position to stop thrusts through it or to drop back and cover passes in case they are attempted.

Shave Without A Razor

New Remarkable Discovery Gives You A Cleaner, Quicker Shave

Read What J. R. of Chicago says: "It's great. Gives me the closest shave I've ever had. Send 3 more."

And another from C. W. who says: "Although I hesitated at first, I am now glad I ordered 'Smile.' It's just like wiping my beard off my face. Saves me time and money. Send 4 more."

The new sensation "Smile" removes your beard almost instantly and leaves you with the slickest, smoothest shave you've had in years. Just rub it on -- then wipe it off -- and your beard is gone; so completely that not the slightest stubble can be felt. Scientifically made after years of experiment in "Smile" laboratories by men of long and successful experience, thoroughly tested and widely endorsed, "Smile" now makes shaving a pleasure. No matter what kind of skin you have, "Smile" eliminates that cutting or smarting a razor gives you, and leaves you with an after-feel of facial comfort. Used by thousands the world over. Easily and swiftly applied. Guaranteed harmless. Will not cause itch, rash or ingrown hair. You need only use once or twice a week since it helps prevent rapid re-growth.

Guaranteed Satisfaction or Money Back

You take no risk. Get "Smile" today. Remember—you are getting a tested, harmless, guaranteed product. Send no money. When big full size package arrives, pay postman only $1.00 and postage. Two packages for only $1.75. You'll be delighted with this new easy razorless shave. WOMEN: It is so gentle on the skin that even women find it priceless for removing hair from face, arms and legs.

E. PAGE CO., Lock Box 813, Dept. S10, Chicago, Ill.

PSYCHIC BASE BALL

A Battle of Wits

A Game of Skill Crowded with Action

$1.00

Complete with Rules Score Cards & Playing Field

Mail Order Direct

If Your Dealer Cannot Supply You

PSYCHIC BASEBALL CORP.
Dept. M.M. 389 FIFTH AVE., N.Y.C.

NO JOKE TO BE DEAF

—EVERY DEAF PERSON KNOWS THAT

George P. Way made himself hear, after being deaf for 25 years, with Artificial Ear Drums —his own invention. He wore them day and night. They stopped head noises and ringing ears. They are invisible and perfectly comfortable. No one sees them. Write for his true story, "How I Got Deaf and Made Myself Hear." Also booklet on Deafness. Address

Artificial Ear Drum

GEO. P. WAY, Inc., 1072 Hofmann Building, Detroit, Michigan

Astrology

Will You Be Lucky in 1932?

What do the stars foretell for 1932? Would you like to know? Our special 12-page Astrological Reading gives predictions, month by month—with exact days, dates and happenings for 1932 based on your sign of the Zodiac. Consult it before making any change in home or business affairs, signing papers, love, marriage, seeking employment, raises in salary, speculation, travel, friends, enemies, health, accidents, lucky days, etc. Send exact birthday with $1.00 for reading.

Franklin Pub. Co., 800 N. Clark St., Dept. 3670, Chicago

GIANT TELESCOPE $1.75

5 Sections—over 3 Ft. Long

See Miles Away! Distant people and objects seem close. Over 3 ft. long, brass bound. Made in Europe. Bbls. of fun. Thousands pleased.

Send No Money! On arrival pay Postman special price, only $1.75, plus postage. Two for $3.25. (Or send price and we pay postage.) Satisfaction guaranteed or money back. Send today. **Bargain House, 427 Randolph St., Dept. 63, Chicago, Ill.**

FREE With Order Strong leatherette Carrying Case and Solar Eye Piece to view the sun.

SAVE UP TO 80% ON RADIO TUBES

LICENSED R.C.A.

30 DAYS FREE TRIAL

If not satisfied, for any reason, tubes can be returned within 30 days for replacement or refund.

Because of the low prices we cannot fill orders for less than three tubes. At these prices you can well afford to keep several tubes in reserve. **GUARANTEED 6 MONTHS.**

	List Price	Now		List Price	Now		List Price	Now
201A	$1.10	$0.45	171	$1.40	$0.55	199WV	$2.75	$0.85
226	1.25	.40	112	1.50	.60	120	3.00	.60
227	1.25	.40	247	1.90	.75	281	5.00	2.25
245	1.40	.55	224	2.00	.80	250	6.00	2.75
280	1.40	.55	199WX	2.50	.80	210	7.00	2.90

ALL OTHER TYPES AT CURRENT LIST PRICES LESS 50%.
We pay delivery charges—cash with order or C. O. D.
Our references: Any Bank.

AUSTIN TUBE DISTRIBUTORS
2632 Shields Ave. Dept. I Chicago, Ill.

Stage Money

Ben Gills to Coshem With Small Size Currency

With these bills it is easy for a person of limited means to appear prosperous by flashing a roll of them at the proper time. By peeling off a genuine bill or two from the out side of the roll the effect created will be all that can be desired. Price postpaid 50 bills 25c, 120 for 50c or $1.00 thousand postpaid

SIBERIAN TRANSPORT CHAIN

A strong chain is thoroughly examined after which the performer's wrists are chained together and locked with a padlock. Under the very eyes of the spectators the performer makes his escape. Creates a sensation in the parlor or on the stage and is highly recommended. Very easy to perform. Price 75 cents.

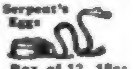
OAKS' CARD TEARING FEAT

A favorite with the late Alexander Herrmann and other magicians of note. For this seemingly impossibility we offer two methods of working so that the novice may perform the trick with equal ease. Neat leaflet illustrating five complete methods. Price 25c.

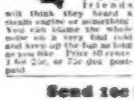
FREE—One large die box truck when you have sent in orders amounting to $25 within one year.

OAKS' CARD MIRACLES

At the request of many of our customers we have made up a few of our most popular tricks. These tricks are all easily performed, for instructions tell how to do each trick. The box contains the Disappearing Spots, Blinking Cards, Phantom Cards, Pick It Out Card, Naked Card Trick, Educated Card Dice Trick, Rosebud Cards, Diminishing Card Trick and Wonderful Ace Trick. These tricks if purchased separately would cost $1.00. Our price complete 60 cents



Nose Blower

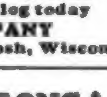


Concealed in the handkerchief Pretend to blow your nose and your friends will think they heard a steam engine or something. You can blow the whole house up a very fine cold and save all the fuss as long as you like. Price 10 cents; 3 for 25c, or 75c doz. postpaid

Fire-Eater

A great trick by which you appear to breathe fire from mouth. Quite harmless. All necessary apparatus and complete for only 30c, postpaid

Serpent's Egg



Box of 12, 10c; 3 for 25c

Send 10c for interesting catalog today

OAKS MAGICAL COMPANY

Dept. 200 Oshkosh, Wisconsin

HOW'D YOU LIKE to Play This Instrument ?

No reason why you shouldn't. Easy Lessons show you how. 5 days' free trial in your own home. A year to pay.

THE whole world seems different when you learn to play and now you can play the most spectacular of all instruments—the Deagan Xylorimba. No long waiting. No finger or lip exercises. No tiresome practice. Start to play very first day even if you can't read a note of music right now. Soon you'll be the "hit" of every party. Maybe, like the Musical Hallmans (Reading, Pa.) you'll make $65 a week spare time.

Our Big FREE Book tells all about the free trial offer, the easy lessons, the wonderful payment plan. No cost or obligation—send in coupon today.

J. C. Deagan, Inc., Dept. 4819, 1770 Berteau Ave., Chicago

Send me, without obligation, full details of Free Trial offer and easy-payment plan of the Deagan Xylorimba.

Name .....

Address .....

NEW ELECTRIC LIBRARY

$1.50 A VOLUME

NEW FROM COVER TO COVER — LATE DATA — HANDY BOOKS — HIGHLY ENDORSED

LATEST INFORMATION

EXPERTS HOME STUDY COURSE

Audels New Electric Library is an entirely new reference Series for engineers, electrical workers, mechanics, maintenance, service men and students. 10 pocket Hand Books, containing 5690 pages—9056 illustrations and diagrams—full information on the latest applications of electricity.

All fully illustrated with test questions, rules, diagrams and calculations—practical ready reference—all up to date.

Highly endorsed—easy to read, understand and own—RED FLEXIBLE COVERS, GOLD EDGES—The complete Library supplied for **50c. a week.** Books $1.50 each and sold separately. No Risk in Ordering—Satisfaction Guaranteed—Shipped Free.

PRACTICAL ELECTRICITY IN A HANDY FORM—Covering: X-Ray, Welding, Ignition, Telephones, Electric Refrigeration, Elevators, Oil Burners, Pumps, Lighting, Signals, Alarms, Illumination, Signs, Talking Pictures, Television, Radio, Railway Signals, Power Stations, Wiring Diagrams for Light and Power, Code, Line and Transmission, Splicing Cables, D. C. and A. C. Systems, Maintenance of Motors and Machines, Troubles, Armature Winding, Experiments, Applications of Electrical Rules and Principles, also hundreds of allied subjects.

PAY 50 CENTS A WEEK

Not a cent to pay until you see the books. No obligation to buy unless you are satisfied. Fill in coupon in pencil. Send now—today—get this new experts standard library.

THEO. AUDEL & CO., 65 W. 23rd ST., N. Y. CITY

FREE EXAMINATION COUPON

Please ship me for one week's free trial "Audels New Electric Library," price $1.50 a volume. If satisfied, I will mail you 50c. or more each week as payment.

Name.....

Address.....

Occupation.....

Employed by.....

MM

Millions of boys know Mr. A. C. Gilbert, champion athlete and champion maker of things boys like. He has devoted his life to the work of making Erector what it is today . . . the most exciting sport any boy ever had.

Hello boys!

1000 Toys in One—

1931's Toy Sensation

4-foot reproduction of the New York Central's crack flyer, the locomotive of the 20th Century Limited. Built entirely with Erector. And you can build hundreds of other realistic models, too.

NOT AN ELECTRIC TRAIN

Build 'em yourself

with ERECTOR the World's Champion Toy

Be a real engineer

Step up boys, and see a railroad locomotive built, right before your eyes. Watch a big steam shovel constructed, part by part.

Not by great engineers, but by boys just like you. Why, *you yourself can reproduce the greatest feats of the world's famous engineers!* You don't know how smart you are, you haven't even dreamed of the exciting thrills a boy can have, until you open up a set of my new Erector.

Be the wonder of your neighborhood

Your friends will flock to your home to see you build things with Erector. Excitement! Boy, Erector brings you thrills you never thought possible and fun you'll never forget, no matter how long you live. Once you get your Erector, you'll be sitting on top of the world.

My crowning achievement

Boys, I've worked many years making Erector better and more exciting every year. Last year boys by the million called Erector the world's greatest toy. But the 1931 Erector is *far more than a toy!* It dwarfs all my previous efforts. It is the pathway to engineering fame for clever red-blooded boys the world over. It is the most exciting sport any boy ever dreamed of.

They hum with action

Yes sir! With Erector you can build real models of great locomotives, traveling cranes, ferris wheels, airplanes, and *hundreds* of other modern inventions.

But that's not all. When you've built them with your own hands, hook them up to the powerful Erector electric motor, and they go into action just like the big ones that engineers build. Erector brings you more real sport and fun than a whole year of 4th of July's.

What you get with Erector

Lift the lid of the red brass-bound chest in which Erector comes to you. See the hundreds of Erector parts. Steel girders with interlocking edges, both straight and curved, made of real structural steel. Wheels, gears, boiler, steam shovel, pulleys, cams, axles, and many other parts for building hundreds of models. But that is not all. No sir! You also get the powerful Erector electric motor and many other feature parts, for automobiles, aircrafts, and other models. All Erector parts are interchangeable. Every part necessary to build Erector models comes with Erector.

With Erector comes the big Erector "How to make 'em Book" which pictures and describes every step in the building of each and every model. Any boy who can read can be a boy engineer with Erector.

How to get Erector

There is something about Erector that will fascinate your Dad. Send for the Erector catalog (see coupon). Show it to your Dad. Take him to the nearest toy store. Let him see the sport and scientific thrills that only Erector can give. Christmas will soon be here. Tell your Dad Erector is what you want. He'll be pleased, and he'll probably sit on the floor with you Christmas morning and help you build your first Erector model.

95 cents and up

Even though I've improved Erector this year, I've also reduced Erector prices so that more boys can share the thrills of building engineering models. Of course, the bigger the set, the higher the price. But there is an Erector set for almost any price your Dad wants to pay. I wish you a merry Christmas and hundreds of happy days next year with Erector.

A. C. Gilbert

FREE . . .

The first 100,000 boys who mail the coupon will get, free of charge, a genuine specimen Erector "How to make 'em Book" which shows exactly how to build thrilling Erector Models, together with the big handsome colored catalog of Erector models and sets. Get your coupon into the mail today, boys, for 36 pages of exciting pictures, diagrams and description.

THE A. C. GILBERT CO.,
244 Erector Square, New Haven, Conn.

Please send me *free*, copies of A. C. Gilbert's genuine specimen Erector "How to make 'em Book" and the big colored catalog of models and sets.

Name .....

Street .....

City ..... State .....

NEW KIND of ROADLIGHT!

TINY INVENTION NOW TURNS HEADLIGHTS INTO SEARCHLIGHTS

—INSTANTLY!

At last! An invention that makes any headlights give at least twice the road illumination! Shoots an entirely new kind of "infused" light that banishes glare! So new and uncanny that it amazes everyone. Now offered for introductory test to all who mail the 10-DAY TRIAL COUPON promptly!

PERFECT-O-LITE astonishes expert and layman alike! Science at last has conquered the grief of night driving!

DOUBLES ROADLIGHT.. BUT ENDS DIMMING!

IT is a well-known fact that motor car manufacturers have solved every big problem *except one*. As soon as the sun goes down at night, the highways of America break forth into a constant rushing stream of "dimming and damning." Speed is cut down one-third to one-half. Every Monday morning finds the highways littered with broken glass, wrecks, cars in the ditch, overturned, shattered against telephone posts. Every man who ever groped dizzily down the highway in traffic at night knows the horrible sensation of being half-blinded by cars on his left, unable to see the ditch on his right, his own lights seeming dim and shadowy and practically worthless. Now, in a twinkling, this curse of night driving is lifted completely and *inexpensively* from the shoulders of the entire motoring world!

Fits Any Headlight

This new lighting discovery is called Perfect-O-Lite. It is a little invention that replaces the ordinary "bulbs" in your automobile headlights. No extra wiring or installation. Millions of motorists have invested from $10 to $25 or more in so-called "Spot" Lights and "Driving" Lights which at best are only makeshifts. This new lighting method costs only a tiny fraction as much, yet actually DOES double road illumination. Banishes need for Glare Shields. Cuts through the other fellow's light, yet absolutely cannot glare in his eyes. Makes ruts, animals, children, detour signs, etc., visible at least three times as far. Now night driving at 40 to 60 miles an hour is safe and easy.

Make Your Own Test Free

The secret of the amazing things this new light does is in the kind of "beam" or "ray" that it throws. Instead of ordinary light, this new invention pours a solid beam of double-reflected or "infused" light down the entire roadway. Shows up ditches at the side, as well as distant objects, absolutely clear. Space here limits further discussion of the facts about this discovery. Under an introductory offer you are now invited to be the judge without risking one penny. The coupon brings full details of the invention, offer of a set on FREE TEST and facts about agents' money-making opportunities. Mail it TODAY!

PERFECT-O-LITE

HACHMEISTER-LIND CO.,
Dept. W-90 Pittsburgh, Pa.

AGENTS! DAVIS MAKES $1400 IN ONE WEEK

Here actually IS that chance for $8 to $11 your FIRST hour, $6,000 to $10,000 THIS year, with no limit WHATEVER for Distributors! Davis, Pa., made $1,400 in one week! Fleet owners buy quantities. Sacks, W. Va., made $236 on one order. Wallace & Tiernan, N. J., trucks just equipped. Blue and Gray Bus Line orders for fleet. Other big orders flooding in. Start full time or spare time. Use coupon for FREE TEST OFFER and get full details of Territory, etc. Guaranteed Sales Plan. Mail Coupon QUICK!

HACHMEISTER-LIND CO.,
Dept. W-90, Pittsburgh, Pa.

Rush details of Free Test Offer, also facts about agents' money-making opportunities, without obligation.

Name .....

Address .....

Town ..... State ...